ENGINEERING NEWS

A JOURNAL OF

CIVIL, MECHANICAL, MINING AND
ELECTRICAL ENGINEERING

2010

VOLUME LIII

JANUARY—JUNE, 1905

THE ENGINEERING NEWS PUBLISHING COMPANY

NEW YORK

INDEX

TO VOLUME LIII, JANUARY–JUNE, 1905

Subdivided into ILLUSTRATIONS: GENERAL (including *Technical Articles, Editorials, Letters to the Editor* and *Current News*); AUTHORS: TABLE OF ERRATA: ENGINEERING LITERATURE and CONTRACT PRICES.

INDEX TO ILLUSTRATIONS.

A.

Air-compressor with mechanically controlled poppet valves.....414, 415
Alternators, Erection of.....307, 309
Arches, Concrete-steel:
C., C., C. & St. L. R. R.....275
Como Park, St. Paul.....352
Gruenwald, Munich.....199, 202
Southern Ry.....214
Thebes bridge.....480, 486
Washington, D. C.....571, 575
Yorktown, Ind.....477, 478
Armory arched roof.....566, 569
Artesian flows from unconfined sandy strata.....329, 330

B.

Baltic stamp mill.....200, 302
Bar channeler, Ingersoll-Sergeant.....34
Beam, Visintini.....219
Bin, Circular, with eccentric hopper.....255, 345
Blades from steam turbines.....367, 371
Blowers, Direct-connected steam turbine.....62, 63
Blue-print washing and drying machine.....140
Boilers:
Exploded boiler.....202
Water-tube.....123
Bottle for collecting samples of water.....444
Brakeshoe for truing up grooved car wheels.....606
Breakwater, Concrete, Marquette, Mich.....189
Bridge bearings, Fixed and expansion shoes, Fades viaduct.....587
Bridge section, at terminals of N. Y. C. R. R.....1, 2
Bridge floors:
Chic. & N. W. Ry., Milwaukee.....265
Fraser River bridge.....649, 651
Reinforced concrete.....162, 164
Bridge joint, Expansion.....481
Bridges:
Bascule, Chicago.....64, 66
Bascule, Short span, Delphos, Ohio.....546
Blackwell's Island.....171
Chain suspension.....269, 270
Charleston, W. Va., Failure.....11, 114, 115, 127
C., C., C. & St. L. R. R.....275
Como Park, St. Paul.....352
Connecticut Avenue, Wash., D. C.....571, 575
Fraser River, B. C.....612, 613, 647, 651
Gilbertsville, Ky., Ill. Cent. R. R.....549
Gruenwald concrete-steel arch.....199, 202
Kentucky River viaduct of 1877.....312, 314
Morgantown, W. Va.....249
Phoenix & Eastern R. R. wreck.....348
Pittsburg, Accident to column.....116
Point Bridge, Pittsburg.....86, 89
Portage Lake, Houghton, Mich., Accident.....582, 583
Southern Ry.....213, 215
Thebes, Ill., cantilever.....479, 487
Wire suspension.....270
Yorktown, Ind., Reinforced concrete.....477, 478
Buckets:
Bottom dump.....234
Depositing concrete under water.....613
Buildings:
Chicago Orchestra, Concrete.....357
Knee-braced.....99
Medical laboratory, concrete-steel.....310, 312
Toledo, Ohio, Concrete-steel.....288, 289
Bulkheads.....43, 504, 510

C.

Car-ferry steamer.....453, 455
Carrier for sewage filter beds.....122
Cars:
Dynamometer.....305, 306
Electric, Paris & Orleans Ry.....211
Gasoline motor.....335
Gasoline-electric motor.....142
Light rural electric.....676
Cement briquette clip.....227
Cement briquettes.....227, 281
Chicago drainage canal, Water-power extension.....25, 27
Clamps for railway rails.....95
Clay deposit, Section of.....478
Coal cutter, Radial.....359
Coal-loading plant, Lorain, Ohio.....410, 411
Cofferdams:
Central Pacific Ry.....231
Charles River dam.....33
Sheet pile and canvas.....330, 331
Column, Bridge, Accident to.....116
Concrete block manufacture, Wash., D.C.....574
Concrete measuring machine.....621, 622
Concrete mold for sewers.....254
Concrete placed in subaqueous molds.....233, 235
Concrete-steel buildings.....310, 312
Concrete-steel forms for floors, columns and girders.....594, 595
Concrete testing apparatus at Columbia University.....561
Controller, Electric street-car.....412
Crane, Locomotive.....234
Crib, Timber.....612
Crib-work.....27
Crowds, Weight of.....341
Culverts, Pressures on, in high embankments.....420
Cutters for hydraulic dredges.....617

D.

Dams:
Arizona Canal.....450, 451
Charles River.....31, 33
Delta Barrage, Egypt.....147, 148
Fenelon Falls, Ont.....135
Granite Springs, Cheyenne.....671, 675
Hollow reinforced concrete.....448, 449
Laguna, Cal.....146
Neosho River, Kansas.....433
Rolling, at Schweinfurt, Bavaria.....57, 58
Roosevelt, Arizona.....35, 36
St. John's Lake, L. I.....134
Shut-off dam.....32
Spring River Power Co.....336, 337
Yuba River, Cal.....609, 610
Derrick, 50-ton steel, for handling heavy blocks.....160
Derrick towers.....568, 569
Device for averaging certain kinds of continuous records.....685
Diagrams:
Air compressor curves.....222
Bending moment in columns.....347
Concrete-steel beams.....496, 497
Concrete tests.....562, 565
Deflection angles for locating spiral curves.....333
Draft of vessels in motion.....276, 278
Eye-bar tests.....205
Filter tests at Anderson, Ind.....556
Formulas for crown thickness of masonry arches.....200
Geometrical proof of prismoidal formula.....362
Iron and steel prices.....70
Operating cost for varying load factors.....169, 170
Overhaul estimating.....198
Plotting paper location of railway.....273
Proportions of ingredients in concrete.....408
Purdue University enrollment.....325
Run-off from drainage basins of Neosho and Verdegris Rivers.....433
Tests of impure sand.....128, 129
Tests of reinforced concrete columns.....614
Test of steam-turbine blower set.....62
Traction required on Manhattan Elevated trains with steam and with electric power.....570
Typhoid fever in Chicago.....611
Velocity of water flowing under ice.....492
Vibrations in power houses.....660, 661
Wave pressures.....192
Diamond-crown, Recovery from borehole.....693
Diamond tools.....60, 61
Door, Folding, for freight houses.....456, 457
Dredge bucket, Orange-peel.....111
Dredge cutters.....617
Dredges:
Alining a dredge.....151
Gold dredge.....441, 442
Drift pin for bridge erection.....38
Drills:
Gasoline rock.....385
Pneumatic plug.....665
Drinker, H. S.....193
Duluth Canal, Storm waves in.....677
Dumping wagons.....498, 677
Dynamometer car.....305, 306
Dynamometers for wave measurement.....191

E.

Ejector for excavating inside of foundation cribs.....613
Electric controller.....224
Electric power:
Spring River, Kansas and Missouri.....336, 337
Utah Sugar Co.....375, 377
Electric railway, Line construction.....300, 305
Elevator safety, Cruickshank.....113
Elevators:
Loading crushed stone.....224
Moving platform, for wagon traffic.....443, 444
Endicott, M. T.....392
Ernst, O. H.....392
Excavator, Scraper.....216

F.

Factory, Shoe, Beverly, Mass.....537, 543
Ferry steamer.....453, 455
Field sheet used in stadia-intersection survey.....329
Filters, Slow sand.....136
Fire doors, Double.....19
Fire protection system for N. Y. City.....318, 319
Flashboard for hollow dam.....450
Floors:
Reinforced concrete, for railway bridges.....162, 164
Test of reinforced concrete.....689
Visintini reinforced concrete.....218
Flumes for transporting logs, lumber and sugar cane.....133, 501, 502
Freeman, J. R.....172
Furnace for rubbish incinerator.....228

G.

Gage for taking artesian well pressures.....502
Garbage wagon.....353
Gas producer, Pintsch suction.....161
Gayley, James.....172
Girders:
Reinforced concrete.....112
Visintini.....219
Gold dredge.....441, 442
Gould, E. S.....124
Grader loading wagon.....429
Grain bin plan.....235, 345
Grand stand at Belmont Park.....298, 299
Guns, Adjustment of.....378, 379

H.

Hains, P. C.....393
Harbor at Manzanillo Bay, Mexico.....157, 159
Harrod, B. M.....393
Harvard Stadium.....434, 437
Headgates of irrigation canal.....429, 431
Heating system for shoe factory.....541
Hydrants, high pressure.....319

I.

Ingersoll-Sergeant Drill Co.'s Works.....678, 679
Inset, Presidents of engineering societies.....172
Irrigation of Canadian Pacific Ry.....429, 432

L.

Lathe-tools with diamond-cutting points.....60, 61
Lieb, J. W., Jr.....172
Line construction for electric railways.....300, 305
Loader for crushed stone.....224
Lock at Charles River dam.....32
Locomotive repair shops.....91, 93
Locomotive valves and valve gears.....458, 460
Locomotives:
Electric:
Paris & Orleans Ry.....210
Valtellina Ry.....402, 403
French, with water-tube boiler.....629
Mallet duplex compound, B. & O. R. R.....630
Tank, on various railways.....167, 168

M.

Machine screw heads.....677
Machine shop construction.....539
Magoon, C. E.....392
Manzanillo Bay, Mexico.....157, 159
Maps:
Australia.....16
Canadian Pacific Ry. irrigation work.....430
Chicago and St. Louis railway routes.....355
Denver, N. W. & Pac. Ry.....242, 243
Electric railways of the Central States.....360
Evaporation observations in the U. S.....354
Hudson River tunnels.....85
Ithaca, N. Y.....413
New York City.....318
Panama Canal.....424, 425
Peru.....464
Roosevelt dam, Arizona.....35
Sacramento River.....251
San Pedro, Los Angeles & Salt Lake Ry.....662
Siberian Railway.....342
Spring River Power Co., Kansas and Missouri.....336
Marceau, Ernest.....84
Measuring machine for granular materials.....621, 622
Medical laboratory at Brooklyn Navy Yard.....310, 312
Mill buildings, Knee-braced.....99
Moving platform for wagon traffic.....443, 444

O.

Overhaul diagram.....198
Onderdonk, Andrew.....681

P.

Pavements, Concrete, Richmond, Ind.....215
Philippine Islands, Concrete work.....581
Piers:
Central Pacific Ry.....261
C., M. & St. P. Ry, Concrete.....331, 332
Fades viaduct.....586, 588
Gilbertsville, Ky., Concrete-steel.....549, 551
New York, Piers and bulkheads.....504, 510
Superior Entry, Wis., Concrete.....233
Washington, D. C., Concrete.....572
Pile driving with water jet device.....457
Piling, Ring-braced sheet, for reservoir construction.....624
Pipe:
Cast-iron, Phil.....351
Reinforced concrete.....246, 247
Pipe-bending machine.....321
Pipe joints:
Lead, for high pressure fire mains.....319
Wood stave pipe and steel elbow.....376
Pipe scrapers.....14, 15
Planimeter, Special use of.....685
Plug drill, Pneumatic.....694
Pneumatic hammers in quarry work.....34
Pump well.....413, 414
Pumps at Bethlehem.....468

R.

Race track at Belmont Park.....297, 299
Rail clamps.....95
Rail handling machine.....416
Rails, T, for street railway.....7
Railway station, Sydney, N. S. W.....327, 328
Railway terminal system at Chicago.....175
Railway wreck.....226
Railways:
British North Borneo.....466, 467
Denver, Northwestern & Pacific.....241, 244
Peru.....464
Reaming drift pin.....38
Refuse destructors in England.....405, 407
Reservoir, Granite Springs, Cheyenne.....671, 675
Retaining walls:
Concrete.....195
Diagrams of reinforced concrete.....9
Seattle, Wash., Concrete.....202, 204
Stone.....195
Water-power channel, Concrete.....27
Rock drill, Gasoline.....384
Rock excavation begun with Rand drills.....25
Roofs:
Armory three-hinged arch.....566, 569
Concrete-steel slab.....666
Reinforced concrete roof span of warehouse.....422
Sawtooth roof of shop.....678
Roundhouse, Reinforced concrete.....153
Rubbish incinerator.....228

S.

Samplers for marl.....479
Sand washer, Koerting ejector.....136
Sand water filters.....136
Scale for plotting contours.....685
Schneider, C. C.....172
Scraper excavator.....216
Screw heads.....677
Septic tank at Saratoga Springs.....120
Settling tank at head of artesian wells.....413
Sewage aerator and dosing tank.....121
Sewage cage, screen and hoist.....119
Sewage filter beds, Saratoga Springs.....118, 122
Sewage pumping station.....119, 120
Sewers:
Concrete construction.....255
Reinforced concrete block.....8
Shonts, T. P.....392
Side-leveler, Contractor's.....619
Sinking shoes for pump well.....413
Speed transmission device.....145
Spillway of irrigation canal.....432
Spring-sprocket, Pope.....592
Stamp mill, Baltic.....200, 302
Steam turbine, De Laval.....62
Steam turbine vanes.....369, 371
Steamer, Stone-carrying.....59
Storage battery plate.....461
Street-car controller.....412
Subway, Concrete at Winnipeg.....196, 197
Subway for pipe and wires.....172
Superheaters on locomotives.....654, 657

T.

Tanks, Acid and bleaching.....197
Theodolite for tunnel cross-sections.....229
Third rail, Protected.....142
Track elevation at Milwaukee.....265
Train wreck.....228
Transmission line, High tension.....337, 338
Traveler, Thebes, Ill., cantilever bridge.....484, 485, 487
Trestle with solid floor.....323
Tunnels:
Gunnison, Cave-in.....680
St Mary's Park, N. Y. C. R. R.....176, 177
Turbines at Spring River Power Co.....338

U.

United Shoe Machinery Works.....537, 543

V.

Valves:
Automatic regulating for reservoirs or standpipes.....253
Balanced inlet filter.....136
Variable-speed gear.....503
Viaducts:
Fades, near Vauriat, France.....585, 589
Horse Run.....598, 600

W.

Wagon loader for crushed stone.....224
Wagons, Dumping.....498, 677
Wallace, J. F.....392
Warehouse, Reinforced concrete.....594
Water-gaging device for supplying water to concrete mixer.....237
Water jet device for pile driving.....457
Water meter tests, Des Moines, Ia.....236
Water-works at Amsterdam, Holland.....438
Wave action.....189, 193
Way-bill, Old stage-coach.....388
Weirs, Cippoletti.....675
Wells, Artesian.....413
Wharf at Tampico.....604
Wheel loads.....42
Wire from broken bridge cable.....115
Wire rope stresses.....349

Prefers to insets.

143665

GENERAL INDEX.

Accidents:
A.
Boiler explosions:
Brockton, Mass., shoe factory...325, 445
N. Y. C. & H. R. R. R. locomotive... 155, *202
Water-tube boiler, Jacksonville, Fla. 373
Bridges:
Charleston, W. Va..... *10, *114, 175
Houghton, Mich..... 475
Phoenix & Eastern Ry., Tempe, Arizona *357
Pittsburg, South 22d Street.*116, 125,*127
Portage Lake, Mich.....*581
Saybrook, Conn..... 606
Building failures in New York City. 325
Church floor collapse..... 239
Coal mine explosions....239, 285, 373, 475
Dam, Lake Vera, Bay Counties Power Co..... 393
Dynamite explosions 177, 523
Elevated railway of Chicago..... 289
Fires:
Indianapolis, Ind..... 211
New York Subway at 168th St..... 373
Pier fire at New Orleans..... 238
Flywheel accidents.....155, 396
Gas explosion at Garnett, Kan..... 130
Locomotive boiler explosion, N. Y. C. R. R..... 155,*202
Mine accidents 289, 475
(See also above, Coal mine explosions.)
Naphtha ship blown up..... 23
New York subway flooded..... 631
Railways:
Canadian Pacific 238
Erie 211
Lake Champlain & Moriah....*226, 229
N. Y. C. & H. R., Mentor, Ohio..687, 692
Penn. R. R., at Harrisburg.....523, 553
Pitts., Ft. Wayne & Chic., Clifton, Pa..... 289
Statistics 106, 393
Reservoirs:
Fort Wayne, Ind..... 177
Madrid, Spain 393
Steam turbine, England 557
Submarine boat explosion..... 211
Tornado in Oklahoma and Texas..475, 523
Tunnels:
East River, Man blown through roof. 349
Gunnison, Cave-in 606, *680
Wall blown over at Minneapolis..... 23
Africa, Notes of an engineer in. By W. E. Crane 345
Air:
Humidity in heated houses..... 289
Washing air in office buildings..... 558
Air compressors:
Five-stage, in England..... 96
Ignitions and explosions in the discharge pipes and receivers. By A. M. Gow.....220, 230
Mechanically-controlled poppet valves. Cincinnati valve gear *414
Specifications for compressor for pumping plant at Spring Lake, N. J... 223
Traction plant for U. S. Navy Yard, Mare Island, Cal..... 499
Alternators, Erection of, for Interborough Rapid Transit Co. By R. L. Wilson *306
American Electrochemical Society, Convention 471
American Forest Congress.....37, 39
American Foundrymen's Association, Convention 622
American Institute of Architects, Convention 123
American Institute of Electrical Engineers:
Convention 690
President Lieb. By C. W. Rice..... †74
American Institute of Mining Engineers:
Convention 498
President Gayley. By John Birkinbine 473
American Railway Appliance Exhibition at International Railway Congress. 493, 519
American Railway Engineering and Maintenance of Way Association, Convention 321, 333, 343
American Railway Master Mechanics' Association, Convention 666, 687
American Society of Civil Engineers:
Conventions 102, 685
President Schneider. By James Christie ..... †71
American Society of Mechanical Engineers:
Convention 615
President Freeman. By F. P. Stearns †72
American Water-Works Association, Convention 521
Anchor bolts, Holding power of..... 19
Anchor ice, Formation of, and precise temperature measurements. By H. T. Barnes 627
Apprentices, Engineering, at the works of the Westinghouse & Electric Mfg. Co. By H. Eloesser 485
Arches:
Concrete:
C., C. C. & St. L. R. R. bridges. By G. A. Stearns *275
Wash., D. C., Conn. Ave. bridge.*571, 577
Concrete-steel:
Gruenwald bridge at Munich. World's largest arch *199
St. Paul, Minn., Foot-bridge in Como Park *352
Yorktown, Ind., bridge.....*477
Masonry:
Crown thickness and crown pressure. Comparison of Scheffler's and Low's formulas. By Emile Low 626
Formulas for crown thickness and skewback depth. By D. B. Luten, C. H. Wallace 260, 494
(See also Bridge floors; Floors.)
Architects:
Architects and municipal school work. 123
Relation of the engineer to the architect. By C. T. Purdy, G. V. Rhines. 103, 419
Armory with 3-hinged arch roof.....*566
Armory, U. S., Historical sketch of engineer corps 68
Artesian flows from unconfined sandy strata. By M. L. Fuller.....*329
Artesian heads, Measurement of low. By M. L. Fuller *593
Artesian water supply of Ithaca, N. Y. By F. L. Getman *412
Ashlar, Cracking of, backed with concrete 41
Asphalt pavements:
Traction tests at Iowa State College.. 143
Traffic census taken in N. Y. City.... 194
Assessment for pavements in New Jersey 172
Automobile fire apparatus in Hahover, Germany 576
Automobiles:
British regulations for the use of heavy 409
Manufacture in France..... 349

B.

Bacteria:
Functions of various types of bacteria in the purification of sewage, with some methods for their quantitative determination. By H. W. Clark and S. DeM. Gage 27
Vertical and lateral penetration of sewage bacteria into chalk soil..... 116
Ballast of blast furnace slag. By E. K. Morse, F. D. Hain.....162, 173, 285
Ballasting, Society report on..... 321
Baltic stamp mill at Redridge, Mich....*299
Baltimore, adjusted losses on fireproof buildings. Report of National Board of Fire Underwriters 136, 150
Banana elevator and conveyor.....122, 317
Barytes and its preparation for the market. By Edwin Higgins, Jr..... 193
Beams:
Bending moment, Sign of..... Eng. Lit., Feb. 16, Mar. 16
Iron beams, German invention..... 149
Rules for safe loads of steel and timber beams. By V. H. Poss..... 421
(See also Concrete-steel construction.)
Bidding. (See Contracts and contractors.)
Bins:
Corner slope of square hoppers: a table of cotangent squares. By C. T. Lewis 346
Determining the capacity of a cylindrical grain bin with eccentric conical hopper. By B. F. Groat, Robert Fletcher *235, *345
Blast furnace gas, Commercial possibilities of, for the development of electric power. By F. DuP. Thomson. 270
Blast furnace slag used for ballast. By E. K. Morse, F. D. Hain..162, 173, 285
Blasting:
Log mat for covering blaste. By Edward Burns 285
Methods and cost of blasting and handling boulders. By D. J. Hauer... 3
Block system. (See Signals and signaling.)
Blower, Sturtevant, Efficiency test of, and of direct-connected De Laval steam turbine. By C. R. Waller... *62
Blowholes in steel forgings, Remarkable. 125
Blue-print washing and drying machine, Pease *140
Boiler explosions:
Grover & Co., Brockton, Mass.....325, 445
N. Y. C. R. R. locomotive.....155, *202
Water-tube boiler, Jacksonville, Fla... 373
Boilers:
Defects, as reported to Fidelity & Casualty Co. during 1904 267
Double-end water-tube boilers in plant of Phil. Rapid Transit Co..... 558
Water-tube boilers of Atlas Engine Co.*123
Bolts, Anchor, Holding power of..... 19
Borings:
Deep bore holes..... 492
Method of recording earth borings. By E. R. Schnable 20
Recovery of a diamond-crown from a deep bore-hole. By C. B. Horwood.*693
Bottle for collecting samples of water from various depths. By W. L. Butcher *444
Boulders, Methods and cost of blasting and handling. By D. J. Hauer..... 3
Brakeshoe for truing locomotive and car wheels 606
Breakwaters:
Curved form, Manzanillo, Mexico....*158
Wave action in relation to engineering structures. By D. D. Gaillard...*189
Brick:
Tests of, for the Bureau of Buildings, New York City. By I. H. Woolson. 383, 387
Traction tests on brick pavement made by Iowa State College..... 143
Bridge accidents:
Charleston, W. Va., Failure of Elk River suspension bridge. By H. G. Tyrrell, A. M. Scott....*10, *114, 175
Maximilian bridge, Munich, Report on failure 45, 607
Phoenix & Eastern R. R., Tempe, Ariz. Failure of concrete pier. By C. K. Conard *357
Pittsburg, Pa., South 22d St. Car knocks column out of place. Anchorage of steel columns. By Willis Whited, Wilhelm Hildenbrand..... *116, 125, *127
Portage Lake drawbridge, Houghton Mich., overturned by steamer....*581
Bridge bearings:
Expansion, on railway bridges. By F. S. Rice, G. C. Henning, F. P. Shearwood *437, 446, 495
Expansion joint at connection of suspended span and cantilever arm..*481
Fixed and expansion, on Fades viaduct, Vaurist, France *587
Bridge building, Evolution of American. By C. C. Schneider 648
Bridge design:
Bascule bridges, Concerning various designs of. By Theo. Kandeler, J. B. Strauss 21
Computing deck plate girder railway bridges, Short method for. By P. A. Blackwell, M. J. Butler.....231, 284
Wind pressure considerations in the design of long bridge spans. By Theodore Cooper 15, 17
Bridge erection:
Fraser River bridge 650
Terminal improvements of N. Y. C. R. R. at New York City. By F. C. Shepherd *1
Bridge floors:
Blast furnace slag used for ballast. By E. K. Morse, F. D. Hain.... 162, 173, 285
Chic. & N. W. Ry., Milwaukee, Wis..*264
Concrete-steel construction for railway bridges as used by various railways.*161
Fraser River bridge *649, *651
Bridge office drafting rules. By H. G. Tyrrell 302
Bridge renewal, Point Bridge, Pittsburg. By Willis Whited *85
Bridge specifications, Workmanship requirements 481
Bridge stresses in Blackwell's Island bridge. By R. C. Strachan..*170, 173
Bridges:
Arch. (See Arches.)
Barrow River, Ireland. Deep pier foundations 607
Bascule:
Chicago *64, 127
Short span bridge at Delphos, O....*546
Various designs. By Theo. Kandeler, J. B. Strauss 21
Bismarck, Northern Pacific Ry..... 373
Blackwell's Island, East River:
Design of bridge. Use of nickel steel. Differences of opinion 173, 259
Stresses, Computation of. By R. C. Strachan *170, 173
Chain suspension, Early *269
Charleston, W. Va., Failure of suspension bridge. H. G. Tyrrell, A. M. Scott *10, *114, 175
Chicago, Trunnion bascule *64, 127
Delphos, Ohio, Pitts., Ft. Wayne & Chic. Ry..... *546
Duluth ferry bridge in operation..... 552
Gilbertsville, Ky., Piers of reinforced concrete. By W. M. Torrance....*548
Gruenwald, near Munich. Concrete-steel arch *199
Kankakee, Ill., Wash. Ave. bridge.... 94
Kentucky River, viaduct erected in 1877. By J. H. Springer *312
Kilbourn, Wis., Chic., Mil. & St. Paul Ry. By J. C. Hain *330
Maximilian bridge, Munich, Report on failure 45, 607
Morgantown, W. Va., suspension bridge. By W. H. Boughton *249
Phoenix & Eastern R. R., Tempe, Ariz., Pier failure. By C. K. Conard....*357
Pittsburg, South 22d St. Anchorage of steel columns. Accident. By Willis Whited, Wilhelm Hildenbrand.... *116, 125, *127
Point Bridge, Pittsburg, Reconstruction. By Willis Whited *85
Portage Lake, Houghton, Mich., Drawbridge overturned by steamer....*581
St. Paul, Minn., at Como Park. Reinforced concrete *352
Southern Ry. New bridges between Alexandria and Orange, Va. Concrete work. By J. W. Ash.....*214
Suspension bridges, Early American..*269
Texas, Highway bridge building in. By L. S. Leversedge *623
Thebes, Ill., cantilever bridge. Piers, superstructure, specifications for workmanship 451, *479, 583
Wash., D. C., Conn. Ave. concrete arch bridge..... *571, 577, 605
Westminster bridge, Fraser River, British Columbia *611, *647
Yorktown, Ind. Reinforced concrete bridge of 95-ft. span.....*477
(See also Viaducts.)
Buckets:
Depositing concrete under water.*234, *613
Orange-peel dredge bucket.....*111
Building Department of New York City:
Regulations for the testing of new materials of construction 385
Report on the work of the engineering corps 95
Building ordinance of Minneapolis, Violation of 23
Buildings:
Chicago, Orchestra building *356
Concrete, seat-bank *356
Concrete-steel:
Brooklyn Navy Yard medical laboratory *310
Crane girders *112, 152, 175
Illinois Steel Co.'s electric power station. By E. B. Clark..... 454
Masonic Temple, Toledo, Ohio.....*287
Northwest Knitting Co., Minneapolis.*593
Textile Machine Works, Reading, Pa. By L. S. Moisseiff *218
United Shoe Machinery Co., Beverly, Mass. By G. P. Carver.....*537
Watehouse with roof of 102-ft. span, Los Angeles, Cal *422
New York City:
Armory, Three-hinged arch roof construction *566
Report on collapse of flat buildings by Board of Experts 325, 387, 391
Stock Exchange building, Heating, ventilating and cooling 557
Northwest Knitting Co., Minneapolis. *593, *689
Steel, Weight of, in Pittsburg office buildings 79
Textile Machine Works, Reading, Pa., Visintini reinforced concrete. By L. S. Moisseiff *218
Toledo, Ohio, Masonic Temple.....*287
Wind stresses in knee-braced mill buildings. By W. H. Dunham.... *99
Bulkhead and pier construction in New York harbor *503, 504
Bulkhead doors, Operation of, by power from a central station on warships of U. S. Navy 155
Burning out of street-car controllers. By S. W. Ashe *411

C.

Canadian Society of Civil Engineers:
Convention 129, *1
President Ernest Marceau.....
Canals:
Chicago drainage:
Auxiliary channels Calumet and Evanston 135,
Water power development. Plan prepared by Isham Randolph.....
Duluth canal, Storm waves in, 1901. By D. D. Gaillard.....
Headgates, Can. Pac. Ry., N. W. T. *429,
Lake Washington and Puget Sound. Earthwork details. By C. H. Rollins.....
Milner, Idaho, irrigation canal.....
New York barge canal contracts. Lump-sum vs. unit-price bidding.. 17, 45,
Panama:
Administration affairs. Criticism of Mr. Wallace. Abolition of Commission recommended by President Roosevelt..39, 41, 78, 97, 130, 257,
Applicants for positions.....
Board of consulting engineers.....
Commission, Members of. Secretary Taft's recommendations. President Roosevelt's order 370, *393,
Earthquakes and a sea-level canal. By R. S. Blinn .....
Employees, Rules concerning....518,
Engineering staff, Discontent in....
Equipment of engineers going to Panama. By H. A. Harris, A. S. Ackerman, Jno. Stockton..... 225, 229, 285,
Report of the Isthmian Canal Commission.....
Report by W. H. Burr and W. B. Parsons..... 229,
Report of Chief Engineer John F. Wallace.....417,
Prussian canal system to be extended.
Car, Slag-ladle .....
Car ferry of Mich. Cent. R. R.....*433
Car wheels:
Flange breakage.....
Guarantee for cast-iron wheels.....
Cars:
Cleaning, Vacuum system of.....
Couplers, Discussion.....
Dynamometer car "Louisiana" at St. Louis Exposition.....*305
Electric cars on Paris & Orleans Ry..*210
Freight cars in Europe, Size of.....
Freight cars in U. S., Size of.....
Gasoline motor car, Union Pacific Ry..*355
Gasoline-electric motor cars:
General Electric Co. By W. B. Potter.....*142
St. Joseph Valley Traction Co.....
Lighting, heating and ventilation discussed at International Railway Congress.....
Refrigerator cars, Chicago.....
Steam motor cars:
Gwalior State Rys., India.....
Great Central Ry., England.....
With detachable engines on English railways.....*463
Steel cars at Railway Appliances Exhibition at Washington.....
Cement:
Experiments with materials which retard the activity of Portland cement, at Cornell University. By R. C. Carpenter.....
Notes of lutes and cements useful to engineers. By S. S. Sadtler.....
Production of hydraulic cement in the U. S. in 1904.....
Prospecting and sampling deposits of raw material for Portland cement manufacture.....*478
Setting or hydration of Portland cement. By Clifford Richardson....
Specifications, British standard.....*227
Cement briquettes:
British standard.....*227
Disintegration of Portland cement by oil and by experiments to prevent it. By J. C. Hain, M. Tech..*279,
Cement kilns, Rotary, Efficiency of water gas boilers in connection with. By A. B. Helbig.....
Census of population, Proposed quinquennial.....
Central stations. (See Electric power; Electric railways.)
Cesspool cleaner, Vacuum, English....
Chemical analyses, Inaccuracy of....
Chemistry, Analytical, Present condition of. By W. F. Hillebrand .....
Chicago:
Park system.....
Surveying in. By S. N. Howard.....
Chicago River lighterage service.....
China, Notes of an engineer in. By W. E. Crane.....
Chromium, Electro deposition of.....
Civil Service examinations:
Panama Canal work, Assistant Civil Engineers. List of questions.....
Suggestions. By A. S. Burgess.....
Clamps for railway rails.....
Clay deposits, Drilling in. Sampling deposits for cement manufacture....*478
Cleaning system, Vacuum.....
Cleveland Civil Engineers' Club, Silver anniversary.....
Cleveland public buildings.....
Coal briquetting plant, Gallup, N. M....
Coal cutting machine, Ingersoll-Sergeant radial.....*359
Coal handling plant, Balt. & Ohio R. R., Lorain, Ohio. By W. M. Ray.....*410
Coal mine explosions.....239, 285, 373, 475
Cofferdams:
Charles River dam and basin at Boston. By J. A. Holmes.....*31
Sheet pile and canvas. By J. C. Hain.*330
Colloidal suspensions.....

*refers to illustrations and † to insets.

Columns:
Anchoring steel columns....125, 205
Bending moment in columns due to eccentric loading, Diagrams for. By S. F. Holtzman.... 346
Choice between cast-iron and steel columns in buildings.... 448
Eccentric loading of columns...494, 664
(See also Concrete-steel construction.)
Compressed air accident at East River tunnel.... 349
Concrete:
Cost of concrete deposited in molds under water.... *232
Destruction of concrete by alternate freezing and thawing between tide levels. By W. B. Mackenzie.... 231; 345, 360
Efflorescence on concrete, Prevention of. By C. H. Cartlidge.... 41
Fireproof properties. By E. T. Cairns. 390, 470
Flue gases and moisture, Effect of, on concrete.... 288
Placing concrete under water, Superior Entry, Wis.... *232
Proportions of ingredients in Portland concrete, Diagrams. By R. T. Dana 408
Protection of steel from rust by embedding it in concrete. By A. M. Scott, J. T. Ford, J. A. Shinn, J. S. Mack.... 316, 389, 447
Report of American Railway Engineering and Maintenance of Way Association.... 323
Sand, Tests of impure, C. M. & St. P. Ry. By J. C. Hain, C. C. Huestis. 127, 231
Sand specifications.... 125
Tests of concrete in tension and compression at Columbia University laboratories. By I. H. Woolson..*561
Waterproofing concrete structures. By W. H. Finley.... 95
Concrete block construction:
Advantages of concrete blocks over monolithic concrete as a building material.... 283
Connecticut Ave. bridge, Wash., D. C. 572, 577
Cost of making blocks and prices charged, in Iowa. By L. L. Bingham.... 358
Fireproof properties. By E. T. Cairns. 390, 470
Good taste in concrete block construction. By L. F. Brayton.... 492
List of manufacturers of concrete blocks.... 386, 422, 448
Prizes offered by Engineering News for best papers on manufacture and use of concrete blocks.315, Eng. Lit. Mar. 16
Specifications for hollow walls. By F. W. Haglock.... 440
Concrete mixing:
Southern Ry. improvement work. By J. W. Ash.... 214
Water-gaging device.... *237
Concrete molds:
Columns, girders and floors....*593, *594
Subaqueous pier construction.... *232
Traveling form for constructing the invert of concrete sewers. By R. R. Evans.... *254
Concrete pump pit, Bangor, Me.... 78
Concrete walls of coke ovens.... 422
Concrete-steel construction:
Bond, Value of a mechanical, in reinforcing rods for concrete. By Ernest McCullough.... *152
Brooklyn Navy Yard medical laboratory.... *310
Comparison between plain and distorted bars for reinforcing concrete. By D. B. Luten, T. L. Condron.... *495
Comparative tests of plain and reinforced concrete columns. By E. J. McCaustland.... 614
Considère's law. Investigation at Stuttgart Technical College.... 75
Economical construction of beams and floor slabs. By C. R. Steiner.... 256
Electric power station of Illinois Steel Co. By E. B. Clark.... 454
Factory building of the United Shoe Machinery Co., Beverly, Mass. By G. P. Carver.... *537
Harvard amphitheater.... *434
Indiana Engineering Society discussion 68
International Railway Congress discussion.... 513
Masonic Temple, Toledo, Ohio.... *287
Report of American Railway Engineering and Maintenance of Way Association.... 322
Ritter's formula for beams. By John Hawkesworth, A. S. Solow.... *21, 41, *151, 283
Shear, Distribution of, over the section of a beam. By J. G. Little.... 547
Slab roofing for warehouse.... *665
Vibration in structures. By R. G. Lawry.... 554
Visintini system used for floors of Textile Machine Works, Reading, Pa. By L. S. Moisseiff.... *218
Warehouse of Northwest Knitting Co.. *593, *689
Wharf at Tampico, Mexico. By E. H. Connor.... *603
Contract work. Recording the cost of.. 230
Contractor's side-leveler. By G. W. Lee.*618
Contracts and contractors:
Awarding separate items of work to bidders on reclamation sewer contracts.... 554
Engineer's fault: a discussion of specifications, contracts and law cuits. By J. C. Wait.... 594
Law affecting sub-contractors and sellers of material to parties holding government contracts.... 339
Legal decision in the District of Columbia.... 663
Lump-sum vs. unit-price bidding. Rarity of lump-sum bids for New York barge canal work. By Alexander Potter, C. S. Burns..17, 98, 100
Controllers, Electric street-car, Burning out of. By S. W. Ashe.... *411
Conversion table from an engineer's notebook. By C. H. Nicolet.... 76
Conveyors:
Belt conveyors of the Lake Shore Stone Co.... *59, 151
Efficiency of belt conveyors.... 339
Copper production of the U. S.... 600
Copper sulphate treatment. (See Water purification.)
Corporation, Fixing reasonable rates for a franchise holding.... 343
Corrosion of copper by sea water, Prevention of.... 559
Cort, Henry, Case of. By C. H. Morgan. 340
Cost figuring.... 78
Counterweights for large engines. By D. S. Jacobus.... 659
Couplings, Hose and hydrant, Standard for.... 522
Cranes, Locomotive:
Bucyrus wrecking crane.... 373
Crane used in pier construction at Superior Entry, Wis.... *232
Creosoted wood. (See Timber preservation.)
Crib, Timber, for Fraser River bridge pier.... *612
Cross-sections, Calculating irregular. By Walter Seely, J. S. Worley, H. A. Dawley, J. J. Hoopes, J. A. Macdonald....17, 126, 174, 284, 521
Crowds, Weight of. Experiments at Harvard University.... *341
Culverts under high embankment, Computing the load of. By G. R. Winslow, C. K. Mohler, M. P. Clements. 259, *420, 447
Current-meter gagings. (See River gagings.)
Curves, Diagrams for spiral. By A. M. Haynes.... 333
Cutters for hydraulic dredges working in hard material at Alameda, Cal..*617

D.

Dams:
Arizona canal. Construction, destruction and repairs. By H. F. Robinson.... *450
Bear trap design, References to articles on.... 77, 175
Charles River, Boston. Foundations of the lock and sluices. By J. A. Holmes.... *31
Concrete, St. John's Lake, Long Island, N. Y.... *134, 149
Concrete-steel, Fenelon Falls, Ontario. *135, 149
Concrete, with macadam core, Spring River Power Co., Kansas and Missouri.... *336, 343
Cross River, Bids.... 607
Egypt. Grouted rubble core walls for the weirs of the Delta Barrage...
*146, 149
Fenelon Falls, Ontario.... *135, 149
Flashboard for use on hollow dams....*450
Gravesend, England, across the Thames 211
Grouted rubble core walls.... *146, 149
Hollow reinforced concrete, Schuylerville, N. Y.... *448
Ithaca, N. Y., Failure of dam near.... 603
Laguna of Yuma irrigation project, Cal.... *146, 149, 624
Masonry dam for the Granite Springs reservoir, Cheyenne Water-Works..*671
Masonry dams, Five notable.... 149
Rock-fill dam, Col.... *146, 149
Rolling dam at Schweinfurt, Bavaria. By Emile Guarini.... *57
Roosevelt masonry, Salt River, Arizona.... *34
St. John's Lake, Long Island, N. Y.. *134, 149
Schuylerville, N. Y., Hollow concrete. *448, 634
Shut-off dam at Charles River, Boston. *32
Yuba River, Cal., Debris barrier....*600
Debris barrier in Yuba River, Cal.....*600
Denver, Colo., Engineering and industrial enterprises in and near.... 555
Derricks:
50-ton steel, for handling heavy blocks on breakwater.... *180
Handling boulders with. By D. J. Hauer.... 4
Diagrams for spiral curves. By A. M. Haynes.... 233
Diamond-crown, Recovery from a deep borehole. By C. B. Horwood.... *693
Diamond tools, Manufacture and use of. By G. C. Henning.... *60
Dictionary of mechanical drawing proposed. By G. H. Follows.... *69
Docks, Coal, Balt. & Ohio R. R., Lorain, Ohio, Cost of. By W. M. Ray.... 411
Doors, Folding, for freight houses and warehouses.... *456
Drafting rules for bridge office. By H. G. Tyrrell.... 302
Drainage:
Illinois:
Inlet Swamp District.... 89
Wheaton system. By W. B. Ewing.. 115
Iowa, Western.... 94
Method of computing flood discharge and cross-section area of streams. By E. C. Murphy.... 355
Ohio drainage basin, Drought in, during 1904. By E. C. Murphy.... 490
Run-off from drainage basins of Neosho and Verdegris River, Kansas. By E. C. Murphy.... 432
Drains:
Prices for, Wheaton, Ill.... 116
Types of filter underdrains for slow sand water filters.... *136
Drawing, Universal dictionary of mechanical, proposed. By G. H. Follows.... *69
Dredge buckets, Clam-shell and orange-peel.... *111
Dredges:
Alining a dredge. By R. E. Parker..*151
Cutters for hydraulic dredges working in hard material at Alameda, Cal.... *617
"Florida," snag and dredge boat.... 267
Gold dredge, Bucyrus, at Oroville, Cal.*441
Dredging, Gold, Cost of, in California.. 492
Drift pin for bridge erection. By F. T. Darrow.... *38
Drill companies consolidate.... 669
Drilling, Machine, Cost and record of, in the Gravehals tunnel, Norway.. 2
Drills:
Dallett pneumatic plug drill.... *606
Gasoline rock drill "Bull Dog".... *385
Drinker, Henry S., Sketch of.... *665
Dumping wagons.... *498, *677
Dynamite explosions.... 177, 523
Dynamometer car, Air-resistance.... *305
Dynamometer tests of wave force. By D. D. Gaillard.... *191
Dynamos:
Erection of 5,000-KW. engine-driven alternator, Rapid Transit Co.... *306
500-volt unipolar dynamos.... 154
Single generators in power plants. By H. S. Knowlton.... 503

E.

Earth borings:
Deep borings.... 492
Method of recording. By E. R. Shnable.... 20
Earthquake in India.... 393
Earthwork:
Allowance for "swell" caused by driving piles.... 232
Computations of. Use of end-area and prismoid formula. By H. W. Sheley. 41
Diagram for estimating overhaul, Denver, Enid & Gulf Ry. By W. D. Gerber.... 198
Seattle and Lake Washington Waterway Co. By C. H. Rollins.... *43
Ejector for excavating inside of foundation cribs.... 613
Electric arcs.... 473
Electric generators:
500-volt unipolar dynamo.... 154
Interborough Rapid Transit Co. By R. L. Wilson.... *306
Single generating units in power plants. By H. S. Knowlton.... 503
Electric lamp filament made of metal tantalum.... 289
Electric lighting in New York City. Proposed municipal plant. Report of Legislative Committee. 17, 177, 469, 474
Electric motor, Largest ever built.... 288
Electric power:
Blast furnace gas, Commercial possibilities of. By F. Du P. Thomson.. 270
Cost of, Effect of load factor on. By E. M. Archibald.... 169
Cost of production and transmission for electric railway operation in Indiana. By A. S. Richey.... 159
Disturbances in high-potential systems. 690
Illinois Steel Co.'s power station, South Chicago. Concrete construction. By E. B. Clark.... 454
London. Generating units of 10,000-KW. capacity.... 427
New York City. Legislative restriction to the development of electric power in connection with the new water supply.... 445
Single generating units in power plants. By H. S. Knowlton.... 503
Spring River Power Co. in Kansas and Missouri. Power transmission plant.*335
Utah Sugar Co., in the Bear River valley.... *375
Electric railways:
Bloomington, Pontiac & Joliet, Line construction. By G. A. Damon.. 361, *362
Burning out of street-car controllers. By S. W. Ashe.... *411
Chicago municipal system.... 605
Developments in electric traction. Comparison of direct-current and single-phase traction. Comparison of steam and electric traction. By W. B. Potter.... 140
Indiana. Cost of power production and transmission. By A. S. Richey.... 159
Indianapolis & Cincinnati Traction Co, Line construction. By G. A. Damon 361
Indianapolis to Rushville, Single-phase line.... 239
Interurban railways, Existing and proposed, in the Central States.... 360
Lansing, St. John's & St. Louis, Line construction. By G. A. Damon.... 360
Light electric railways. By J. R. Cravath.... *676, 688
Line construction for high-pressure roads, in Europe and America. Various types of construction. By G. A. Damon, Theodore Varney.. *359, *363, 367
Manila, P. I., Opening.... 468
Narrow-gage fallacy.... 688
New York. Manhattan Elevated. Diagram showing traction required with steam and with electric motive power.... 570
New York Rapid Transit:
Causes of high temperatures in the subway.... 625, 663
Interruption of traffic by water from broken main.... 631
Signaling system. By J. M. Waldron. 546
Oerlikon line construction, Huber system. By G. A. Damon.... *360
Single-phase railway, Bloomington, Pontiac & Joliet Ry.... 349
Spindlersfeld Ry., Germany, Line construction. By G. A. Damon.... *359
Third rail, Protected. By W. B. Potter.*142
Three-phase system in the U. S.... 663
Valtellina Ry., Italy. By G. A. Damon. 177, *359
Electric smelting of titaniferous iron ores.... 472
Electrolysis:
Dayton, Ohio, Litigation.... 264
History of theories of. By H. S. Carhart.... 471
Elevated railways of Chicago:
Accident.... 289
Report on methods of increasing the capacity and deadening the noise of the loop terminal. By B. J. Arnold.... 320
Elevators:
Banana elevator and conveyor....122, 317
Defects of, as reported to Fidelity & Casualty Co. during 1904.... 287
Portable elevator for loading stone or sand.... *224
Providence, R. I. Accident to plunger elevator.... 231
Elevators: (Continued.)
Safety of elevators in New York City.. 112
Safety device, Cruickshank. By T. E. Brown.... *113
Embankments:
Chicago drainage canal.... *25
Pressures on culverts in high embankments. By M. P. Clements, G. R. Winslow, C. K. Mohler.... *259, 420
Employers and employees, Relations between.... 76
Endicott, M. T., Portrait of.... *392
Engineering ethics, Question in.... 345
Engineering News, Prizes offered by.... Eng. Lit., Mar. 16, 315
Engineering schools:
Armour Institute.... 475
Compensation of teachers in.... 150
Entrance requirements for engineering colleges. By William Kent.... 111
Harvard University.... 154
Notes from.... 154, 177, 325, 373, 393, 427, 475, 692
Purdue University.... 325
State College of Washington.... 393
Statistics. Practicing engineers and engineering students.... 577
Stevens Institute of Technology....393, 427
Engineering societies, National, Organization and administration of. By J. W. Lieb, Jr.... 678
Engineering specialties, New names for.. 97
Engineers:
Army, Historical sketch.... 68
Employment of American on Grand Trunk Pacific Ry.... 267
Engineer and the business man. By E. S. Gould, J. N. Ambler.... 20, 77
Engineer's fault: a discussion of specifications, contracts and law suits. By J. C. Wait.... 594
Equipment of engineers going to Panama. By H. A. Harris, A. S. Ackerman, Jno. Stockton, H. W. Durham. 225, 229, 285, 346, 447
Inspectors on public work....344, 347
Navy engineers, Pay of civil.... 75
Railway division engineer, Work of. By Willard Beahan.... 577, 580
Relation of the engineer to the architect. By C. T. Purdy, G. V. Rhines. 103, 419
Title, Right to.... 126
U. S. Reclamation Service, Photograph.... *109
Engineers' note books, Form of. Eng. Lit. Mar. 16, May 18.
Engineer's wife, Plea of.... 205, 287
Ernst, Oswald H., Portrait of.... *392
Evaporation observations in the U. S. By H. H. Kimball.... 353
Excavation:
Methods and cost of blasting and handling boulders. By D. J. Hauer... 3
Specifications.... 76
Excavators:
Page scraper excavator.... *216
Wheaton, Ill., Machine used on sewer work. By W. B. Ewing....116, 175
Expansion of railway bridges, Methods of. By F. S. Rice.... *437, 446
Eye-bars, Comparisons of full-sized and specimen tests by Phoenix Iron Co. By O. J. West, J. S. Deans....117, 205

F.

Falseworks at Thebes, Ill., cantilever bridge.... *482, *484
Fence posts, Concrete, Manufacture and cost of. By J. A. Mitchell, A. S. Cushman.... 96, 239
Ferry steamer "Detroit," of Mich. Cent. R. R.... *453
Fieldbooks, Engineers', Proper form for. Eng. Lit. Mar. 16, May 18.
Filter underdrains.... *136
Filters. (See Sewage purification; Water purification.)
Fire apparatus, Automobile, Hanover, Germany.... 576
Fire doors, Requirement of double. By W. T. Murphy.... *19
Fire losses, Adjusted, on the fireproof buildings at Baltimore, Md....136, 150
Fire protection:
New York City. Report by I. M. de Varona on a high-pressure fire system for Manhattan. Exclusion of salt water.... 315, *317, 382
Salt water, Use of, at U. S. Navy Yards 100
Window and door coverings.... 574
Fire protection engineering from the standpoint of the safety of life.... 283
Fires:
Indianapolis, Ind.... 211
New York Subway.... 373
Pier fire at New Orleans.... 278
Flashboard for use on hollow dams....*450
Flood discharge. (See River gagings.)
Floors:
Brooklyn Navy Yard medical laboratory, Concrete-steel.... *310
Columbian long span floor tested.... 106
Illinois Steel Co., Concrete. By E. B. Clark.... 454
North American Cold Storage Building, Chicago, Concrete-steel.... 468
Visintini system of floorbeams, used in Textile Machine Works, Reading, Pa. By L. S. Moisseiff.... *218
Warehouse floor of concrete-steel at Minneapolis.... *593
(See also Bridge floors.)
Flumes for transporting logs, lumber and sugar cane.... *133, *501
Flywheel accidents.... 135, 366
Fog in New York subway.... 17
Forest Congress at Washington.... 37, 39
Forgings, Specifications for locomotive.. 659
Foundations, Deep, in frozen ground, on Trans-Siberian Ry.... 427
Foundry work discussed at American Foundrymen's Association.... 622
Freeman, John R., Biographical Sketch of. By F. P. Stearns.... †72
Freight carriage by caravan in Oriental countries, Cost of.... 279
Freight houses, Need of fireproof.... 284
Frictional resistance of air in large conduits.... 521
Frogs, Use of improved.... 512
Frost, F. W., Information desired.... 555

*refers to illustrations and † to insets.

G.

Gage, Railway, Origin of U. S. Standard 232
Gage for taking artesian well pressures. By M. L. Fuller *593
Garbage collection at Oakland, Cal. Model wagon..... ....*353
Garbage disposal:
Land disposal: an opportunity for engineers and contractors.....367, 601
St. Louis, Mo., Land disposal....130, 367
Garbage furnaces. (See Refuse destructors.)
Garbage wagon..... ....*353
Gas engine lubrication, Prouty-Pierce Locomotive Mfg. Co..... 130
Gas explosion at Garnett, Kansas..... 130
Gas lighting in N. Y. City. (See Electric lighting.)
Gas producers:
Advantages of suction.... 78
Pintsch suction. By S. F. Saeger....*161
Gayley, James, Biographical Sketch of. By John Birkinbine..... .... †73
Gears:
Efficiency test of spur gears used rough as cast..... 155
Newman variable-speed gear.... ....*592
General Electric Co. and its shipments to Mexico. By F. H. Gale..... 316
Generators. (See Electric generators.)
Girders, Concrete-steel:
Girders for erecting shop and crane.. *112, 152, 175
Warehouse at Minneapolis..... ....*593
Glass paving and building brick..... 608
Gold dredging at Oroville, Cal., Bucyrus dredge..... ....*441
Gold production in Australia and the U. S..... 79
Gold saving process for treating slimes from cyanide mills.... 492
Gould, E. S. Biographical sketch of..*124
Grade crossings:
Cleveland, Abolition..... 694
New York State, Report on..... 139
Grader loading wagon on irrigation canal of Can. Pac. Ry., near Calgary, N. W. T..... ....*429
Grading:
Cost of, on Can. Pac. Ry. irrigation work..... 431
Southern Ry. Work. By J. W. Ash...*213
Grain bins. (See Bins.)
Grand stand construction at Belmont Park, Queens, L. I..... .....*208
Green-Gaynor case..... 177
Grouting deposits gravel, sand, etc. By C. R. Steiner..... 447
Gun, Practical method of adjusting a modern, and determining its errors and the errors of its telescopic sight. By Otto Von Geldern.....*377

H.

Hains, Peter C.....*393
Handrailings, Pressure against. By F. V. Meyer..... 520
Harbors:
Manzanillo, Mexico, Improvements....*157
New York:
Littoral drift on the Long Island shore and the New York harbor entrance. By C. E. Gillette..... 126
Report of New York Bay Pollution Commission..... ....464, 470
Harrod, Benjamin M..... ....*393
Harvard University:
Notes..... 154
Proposed alliance with Massachusetts Institute of Technology..... 372, 469, 555, 603
Stadium for athletic contests.....*434
Hauling, Cost of..... 224
Headgates of irrigation canal, Can. Pac. Ry..... ....*439
Heating:
Factory system, Beverly, Mass. By G. P. Carver..... ....*537, *541
New York Stock Exchange building.... 557
Horses, Cost of feeding 224
Hose and hydrant couplings, Standard for..... 522
Humidity in heated houses, Observations by R. C. Carpenter..... 289
Hydraulic formulas:
Method of computing flood discharge and cross-section area of streams. By E. C. Murphy..... 355
Tables for computing the discharge from flowing artesian wells. By C. G. Hubbel..... ....22, 76
Hydrographers, Conference of..... 103
Hygrometry, Elementary facts concerning. By Lane Johnson..... 175

I.

Illinois Society of Engineers and Surveyors, Convention..... 93
Inch of water, Millwright's. By F. H. Shaw, A. M. Swain 345, 369
Indiana Engineering Society, Convention 67
Ingersoll-Sergeant Drill Co., New works of..... ....*677, 688
Ingersoll-Sergeant Drill Co. becomes the Ingersoll-Rand Co..... 689
Inspectors on public work.....344, 347
Insulators, Hickory-wood strain..... 124
Interlocking. (See Signals and signaling.)
International Congress of Technical Education..... 359
International Deep Waterway Commission..... 523
International Railway Congress at Washington.....469, 487, 493, 511, 519
Iron and steel:
Concrete as a preservative. By J. T. Ford, J. A. Shinn, J. S. Mack, A. M. Scott..... ....316, 389, 447
Fluctuations in prices, 1894 to 1904.. 70
Irrigation survey of the Upper Snake River Valley, Idaho. By E. B. Darlington..... 576
Irrigation work by the Canadian Pacific Ry..... ....*429

J.

John Fritz medal awarded to Lord Kelvin 369

L.

Labor question:
Day labor for municipal public works in Chicago. Sewer construction.. 44, 97, 151
Engineering apprentices at the Westinghouse Electric & Mfg. Co. By H. Eloesser..... 485
Hours of labor, Decision of U. S. Supreme Court regarding legislation restricting..... 353
Lake Michigan, Fluctuations in level of. 23, 41
Land reclamation:
California. Report of Commission.... 240, 258
Seattle, Wash. Earthwork details. By C. H. Rollins..... 43
(See also Drainage; Reclamation Service, U. S.)
Lathe tools with diamond cutting-points. *60
Lead poisoning, Prizes for essays on.... 692
Letter copying press for emergency use. By E. P. Osgood, A. G. Collins.. 41, 127
Lettering railway alinement maps..... 232
Leveling, Precise, between the Atlantic and Pacific oceans. By J. F. Hayford, G. W. Colles 279, 420
Lieb, John William, Jr., Biographical sketch of. By C. W. Rice..... ..... †74
Load factor in the cost of electric power. By E. M. Archibald..... 169
Loading crushed stone..... ....*224
Lock and dam on the Kentucky River.. 79
Locomotive boiler explosion on N. Y. C. R. R..... ....155, *202
Locomotive forgings, Specifications..... 659
Locomotive repair shops of Lehigh Valley R. R., Sayre, Pa. By D. C. N. Collins..... .... *90
Locomotive testing plant at St. Louis Exposition..... 415
Locomotive valves and gears:
Allfree-Hubbell system..... ....*459
Haberkorn system..... ....*460
Young system on Chic. & N. W. Ry. *2
Locomotives:
Consolidation freight, Penn. R. R.... 415
Electric:
Paris & Orleans Ry..... .. ....*210
Valtellina Ry..... ....*461
Gasoline:
English engine.. 130
Mining work at Vancouver, B. C... 427
Tunnel work at Santa Barbara, Cal.. 23
High-power locomotives for passenger and freight service..... ....513, 547
Mallet compound:
Balt. & Ohio R. R..... ....*630
Porto Rico..... 451
Pooling locomotives..... 514
Staybolts, Hollow, as a means of admitting air to firebox..... 315
Superheated steam. By H. H. Vaughan.*652
Tank:
Chic. & West. Ind. Ry. suburban service 599
Paris Belt Ry., for freight service.. 607
Suburban service on American railways..... ....*163
Water-tube, on Algerian division of the Paris, Lyons & Mediterranean Ry.*629
Lubricating gas engine cylinders..... 130
Lutes and cements useful to engineers. By S. S. Sadtler..... 9

M.

Machine screws, Standard heads for. By H. G. Reist.....*677
Machine tools:
Condition of tools in railway repair shops..... 558
History of manufacture..... 321
Magoon, Charles E.....*392
Marceau, Ernest, Biographical sketch of. *84
Masonry:
Grouted rubble core walls for the weirs of the Delta Barrage.. .....*146
"Middle-Third" rule of proportioning cross-sections of masonry in compression 493
Massachusetts Institute of Technology, Proposed alliance with Harvard University ..... .372, 469, 555, 603
Master Car Builders' Association, Convention..... ....681, 687
Measuring machine for mechanically measuring the ingredients of concrete and granular materials generally. By E. N. Trump...*620, 625
Mechanical stokers for boiler furnaces. By C. H. Benjamin and others.... 617, 625, 667, 689
Medals of honor, Award of, by U. S. Government..... 393
Medical provision for field parties. By E. C. Church..... 42
Metric system in Great Britain and in Mexico..... ....203, 260, 499
Michigan Engineering Society..... 77
Mine accidents..... ....289, 475
Mortar:
Lime and burnt clay, on the Asyut Barrage..... 177
Strength of mortar made with caked cement..... 457
Motor vehicles:
British regulations for the use of heavy vehicles..... 409
Manufacture in France..... 349
Moving platform for wagon traffic on the street, Cleveland, Ohio.....*442
Municipal engineering in New York City in 1904. By N. P. Lewis..... .. 144
Municipal Museum in Chicago..... 558
Municipal ownership:
Chicago street railways.....373, 387, 427
Gas works in small English town.... 417
Lighting plant for New York City. Estimates. Report of Legislative Committee..... .. ...17, 177, 469, 474

N.

Nails, Galvanized steel, Experience of Pitts. & Lake Erie R. R..... 321
National engineering societies, Organization and administration of. By J. W. Lieb, Jr..... 678
National Forest Congress 37, 39
National Municipal League, Convention.. 474
Navy, U. S.:
Inspection of materials and machinery, Report on..... 22
Pay of civil engineers and naval constructors..... 75
Navy yards, Fire protection of..... 100
New York Bay Pollution Commission, Report of..... ....464, 470
New York City Water Commission..23, 625
New York State Water Commission.... 257, 606, 625
New York Telephone Co., Reduction of rates..... 343

O.

Office methods in railway surveys. By W. D. Gerber..... 193
Oil pipe line from Indian Territory to New York City..... 79
Oil rooms, Inside, Specifications for the construction of..... 575
Onderdonk, Andrew, Sketch of.....*681

P.

Pacific and Atlantic oceans, Precise leveling between. By J. F. Hayford, G. W. Colles..... .... 279, 420
Painting or dipping structural steel.... 580
Panama, Equipment for engineers going to. By H. A. Harris, A. S. Ackerman, Jno. Stockton, H. W. Durham. 225, 229, 285, 348, 447
Park system of Chicago..... 94
Pavement assessments in New Jersey.. 172
Pavements:
Asphalt:
Traction tests at Iowa State College. 143
Traffic census in New York City.... 191
Bituilithic pavement, Specifications for Cincinnati. By J. M. Harper..... 234
Brick, Traction tests at Iowa State College..... 143
Concrete:
Costs, in Iowa. By L. L. Bingham.. 358
Richmond, Ind., Abstracts from specifications..... ....215 508
Discussion at Indiana Engineering Society..... 67
Glass pavement in Europe..... 490
Granite block, Traffic record in New York City..... 195
Iowa, Data on roads and pavements..*143
Macadam, Raveling of, in Springfield, Ill..... 386
New York City, Cost of pavement openings. By Wismer Martin..... 201
Quincy, Ill., Brick pavement 94
Sheffield, England, Notes 24
Traffic census on asphalt and granite pavements in New York City.... 194
Pennsylvania Department of Health.... 685
Pennsylvania Water Supply Commission. 684
Perch, Size of a. By S. W. Stratton, O. H. Fogg..... .... 41, 98
Petroleum briquettes for fuel..... 607
Philadelphia gas lease extension scandal. 493, 553, 557, 583, 600, 630
Philippine Islands, Municipal improvements in Sorsogon. By H. L. Stevens *581
Piers:
Balt. & Ohio Ry. and Ches. & Ohio Ry. piers..... .... 202, 232
Central Pacific Ry. for short bridge spans. By W. N. Frickstad.....*261
Conn. Ave. bridge, Wash., D. C., Concrete..... ....*571, 577
Gilbertsville, Ky., High bridge piers of concrete-steel. By W. M. Torrance..... ....*548
Kilbourn, Wis., Concrete-steel. By J. C. Hain..... ....*330
Masonry, of Fades viaduct.....*585
New York harbor construction of piers and bulkheads..... .....*503, 504
Phoenix & Eastern R. R., Failure of concrete..... ....*357
Superior Entry, Wis., Concrete deposited in molds under water..*232, 233
Thebes, Ill., cantilever bridge.....*489
Pile driving:
Heavy hammer desirable for driving concrete piles. By E. P. Goodrich. 98
Water jet, Use of, at Sandy Hook. By S. A. Jubb..... ....*456
Piles:
Concrete, reinforced, foundation of railway station at Hamburg, Germany. 7, 93
Hand-driven sheet piling, Central Pacific Ry. By W. N. Frickstad....*261
Resistance of, to attacks of teredoes. Experiments in New South Wales.. 451
Ring-braced sheet piling for reservoir construction, Kinston, N. C. By G. A. Rogers..... 624
Wakefield sheet piling, validity of patent on. By G. G. Earl, T. M. Nelson 285
Pipe bending machine, Pedrick & Smith.*321
Pipe coverings on steel pipe at Minneapolis. By F. W. Coppelen..... 552
Pipe joint between wood stave pipe steel elbow..... ....*375
Pipe laying:
Cast-iron pipe, Triple line of 60-inch, from Torresdale filters. By S. M. Van Loan..... ....*351
Cost of laying 12-inch pipe across a river..... 227
Cutting supporting cords of submerged pipe. By H. W. Brinckerhoff..... 316
Pipe scrapers, Automatic and hand, at Melbourne, Aus. By E. G. Ritchie. *14
Pittsburg, Greater 693
Planimeter, Device for averaging certain kinds of continuous records by. By W. L. Butcher *685
Platforms, Moving, in streets of Cleveland, Ohio..... ....*442
Plumbing reform. By M. N. Baker.... 256
Pneumatic hammers in quarry work.... *34
Polarization, Reversibility of..... 472
Poles, Cement-covered wooden, for electric wire lines..... 349
Population, Finding geographical center of..... 287
Posts, Concrete, Manufacture and costs. By J. A. Mitchell, A. S. Cushman. 96, 259
Presidents of four engineering societies. 71, 172
Prismoidal formula, Demonstrations of. 302, 422, 490
Prospecting and sampling deposits of raw material for Portland cement manufacture..... ....*17
Pumping engines:
Commercial engine, The..... 32
Largest engine built, Boston..... 21
Pumping plants at New Orleans and at Pittsburg..... 490
Pumps:
Bethlehem belt-driven pump..... ....*407
Centrifugal pumps, Early history and development. By W. O. Webber.. 615
Deep-well pumps operated by suspended rods from a central station. 55
Efficiencies of motor-driven pumps.... 1
Electric motor-driven centrifugal pumps for hydraulic elevator plant, Kansas City, Mo..... 55
Purdue University..... 32

Q.

Quarry plant at Hueyapam, Mexico.... *

R.

Race track at Belmont Park, L. I.*203, 2
Rack railway, Electric, on Mont Blanc. 1
Rail clamps..... 6
Rail loading and unloading machine..*41
Rails:
Fast trains, Rails for carrying..... 512
Improvement in rails needed. By G. W. Stadly..... 44
Specifications for steel, with especial reference to wearing quality and freedom from breakages 337, 34
T-rails for street railways, Milwaukee. *
Railway accidents:
Canadian Pacific..... 2
Erie..... 2
Lake Champlain and Moriah....*223, 2
N. Y. C. & H. R. Mentor, Ohio....687, 69
Penn. at Harrisburg..... .....523, 5
Pitts., Ft. Wayne & Chicago..... 2
Statistics..... ....106, 3
Railway collision, Exhibition of..... 5
Railway location. By J. C. L. Fish, C. C. Stowell, F. A. Barnes, J. L. Campbell 206, 272, 286, 3
Railway rates, Federal control of....18, 1
Railway repair shops, Economical equipment and operation of..... 4
Railway stations:
Buffalo, N. Y., union depot proposed.. 2
Chicago, Proposed..... ....174, *1
Improvement of passenger stations and terminals..... .... 174, *1
Sydney, N. S. W. By H. Deane.....*3
Teaming yards at railway stations. By H. J. Pfeifer..... 6
Railway surveys, Office methods in. By W. D. Gerber..... 1
Railway terminals:
Can. Pac. Ry., Winnipeg, Manitoba..*1
Cincinnati, Ohio, Improvements..... 2
Sydney, N. S. W. By H. Deane.....*3
Railway yards, Society report on.....*3
Railways:
Australia, Transcontinental, proposed.. 1
British North Borneo Co. By George Cecil..... ....*1
Canadian Pacific, Irrigation project...*4
Canadian transcontinental, Commission *
Central Pacific, Bridge foundations. By W. N. Frickstad..... .....*2
C., C. C. & St. L., Improvements between Indianapolis and Cincinnati. By G. A. Stearns..... ....*2
Chicago & Eastern Illinois..... 3
Chicago & Western Indiana, Equipment for suburban traffic..... 5
China, Notes 6
Denver, Northwestern & Pacific, Construction. By W. P. Hardesty....*2
Electric traction:
Paris & Orleans Ry..... .....*2
Suburban possibilities. Maintenance and operating costs. By C. F. Street..... 5
Grand Trunk Pacific. Employment of American engineers on..... 2
Guayaquil & Quito, Grade and weed destroyer. By J. A. Harman..... 2
Illinois Central:
Local train service between Chicago and Kankakee 5
New Orleans freight terminals rebuilt 4
Specifications for railroad work..... 2
Light railways discussed at the International Railway Congress.... 516, 5
New transcontinental routes..... 1
N. Y. C. & H. R., Bridge erection in connection with terminal improvements. By F. C. Shepherd..... .. *
Penn.:
Accident at Harrisburg 523, 5
Compressed air plants at Hudson and East River tunnels..... 1
Mileage 1
Pension allowances 5
Tree culture, Success of... R... 145, 3
Peru, Development in. By C. R. Enock. 463, ...464, 5
Philippines, Bids for building....630, 6
San Pedro, Los Angeles & Salt Lake..*6
Siberian Ry..... 3
Southern Ry., Double-track work. By J. W. Ash *2
Toledo Railway & Terminal Co..... 1
Trans-Pyrenees, Schemes..... 1
Reaming drift pin for rivet holes, for use in bridge erection. By F. T. Darrow .... *
Reclamation Service, U. S:
Organization of the engineering corps. By F. H. Newell 6
Sewer contracts, Awarding separate items of work 5
Refuse destructors:
Accrington, Eng. 1
Aldershot works, Eng. 4
American and British..... 3
American practice commented on by the London "Times" 6
Battersea, Eng., Utilization of clinker. 3
Birmingham, Eng., Disposal of night soil and refuse 4
Bournemouth, Eng., Old destructor.... 4

*refers to illustrations and † to bists.

Refuse destructors: (Continued.)
Bradford, Eng. 439
British destructors and American garbage furnaces 380, 388, *405, 438
Dalmarnock, Eng. 439
Govan, Scotland 439
Hamburg, Germany 439
Investigation of crematories for New York City. Possibilities of obtaining power from city refuse. 17
Marsh Hill, Eng. 439
New York City, Proposed plant for street sweepings and light refuse...*228
Rochdale, Eng. 403
Salford, Eng. 380
Shoreditch, Eng. 439
Southfield Lane, Eng. 439
Sundridge Road, Eng. 439
Tooting or Wandsworth, Eng. 381
Warwick, Eng. *407
Westminster, Eng. 381
York, Eng. 439
Zurich, Switzerland 440
Rensselaer Polytechnic Institute 177
Reservoirs:
Brick lining, Kinston, N. C. By G. A. Rogers *624
Fort Wayne, Ind., Failure 177
Granite Springs, Cheyenne water-works.*671
Madrid, Spain, Failure 393
Retaining walls:
Ashlar masonry backed with concrete. 41
Chicago drainage canal, Concrete wall. *25
Chicago track elevation, Concrete and stone walls *194
Concrete-steel walls, Analysis and design of. Costs. By F. F. Sinks, C. A. Bone *8, 174
Seattle, Wash., Concrete-steel. By C. F. Graff *232
Stone:
Chicago *194
Milwaukee *264
River gagings:
Convenient method for determining the discharge of streams and canals. By J. H. Cunningham 364, 447
Distribution of velocity in stream flow. Results of measurements. By J. C. Hoyt 38
Herlacher's method 441
Ice conditions:
Effect of, on stream flow 1 2
Records of flow made by U. S. Geological Survey. By F. H. Tillinghast 491
Method of computing flood discharge and cross-section area of streams. By E. C. Murphy 355
Neosho and Verdegris Rivers, Kansas. By E. C. Murphy 432
Parabolic method of computing. By F. W. Hanna 154
River discharge, mean velocity and cross-sectional area curves. By F. W. Hanna 301
Rivers:
Mississippi, Improvements between St. Louis and Cairo. By W. P. Wooten. 247, 257
Neosho and Verdegris, Kansas, Characteristics of. By E. C. Murphy..*432
Sacramento and San Joaquin, Cal. Regulation of rivers and reclamation of land. Report of Commission 250, 258
Roads:
Designing crown of street.....370, 520
Hauling, Cost of 224
Illinois, State appropriation 558
Iowa:
Census of the amount and cost of wagon road traffic 70
Data on roads, Report.*143
Mass. Highway Commission, Report... 416
Rock excavation, Methods and cost of By D. J. Hauer 3
Roller bearings, Tests of Hyatt 418
Roofs:
Concrete, Illinois Steel Co. By E. B. Clark 475
Concrete slab roof for small warehouse *665
Reinforced concrete *422
Saw-tooth roof of shop.....*678
Three-hinged steel arch in armory....*506
Rope:
Formulas for the stresses in wire ropes due to bending around sheaves. By Samuel Diescher, William Hewitt. 149, 348, 418
Use and abuse of wire rope. By L. C. Moore 65
Roundhouses:
Reinforced concrete, Can. Pac. Ry., Moose Jaw, Canada *152
Report of Am. Ry. Eng. & Main. of Way Assoc. 322
Rubber, Increase in consumption and in prices 203
Run-off from drainage basins of Neosho and Verdegris Rivers, Kansas. By E. C. Murphy 432
Russia, Conditions in, as seen by an American engineer. By C. F. de Nevers 600

S.

Safety net used in bridge building..... 551
Samplers for marl deposits.....*479
Sand:
Specifications for sand. Effect of clay in sand on lean mortar mixtures. By E. K. Coe, J. L. Campbell..... 125, 206, 286
Tests of impure sand for concrete, C., M. & St. P. Ry. By J. C. Hain, C. C. Huestis 127, 231
Sand dunes of Amsterdam, Holland. By W. P. Mason *437
Sand washer, Modified form of Koerting ejector *136
Sanitary census of New York City..... 393
Sanitary regulations governing camps:
Contractors' camps on the Pittsburg filtration plant 173
U. S. Reclamation Service. By M. O. Leighton 67
Schneider, C. C., Biographical sketch of By James Christie †71

Scrapers:
Excavator scraper *216
Pipe scrapers in Melbourne, Aus..... *14
Screws, Machine, Standard heads for. By H. G. Reist *677
Septic tanks at Saratoga Springs.....*118
Sewage analyses at Lawrence, Mass. By H. W. Clark and S. De M. Gage... 30
Sewage bacteria, Vertical and lateral penetration of, into chalk soil..... 116
Sewage filter beds at Saratoga Springs..*118
Sewage purification:
Bacterial methods. By H. W. Clark and S. De M. Gage 27
Berlin, Comparison with Paris. By Allen Hazen 285
Paris, Report for 1903..... 285
Saratoga Springs, N. Y.....*118
Sewerage:
Baltimore 607
Bronx Valley, New York..... 607
Design of works in Great Britain and America 39
Liernur pneumatic system, Use of.... 155
Passaic Valley, N. J. Report of New York Bay Pollution Commission.464, 470
Wheaton, Ill. By W. B. Ewing..... 115
Sewers:
Chicago, Experience with day labor.. 44
Concrete, Traveling form for constructing invert. By R. R. Evans.....*254
Concrete-steel block construction. By W. C. Parmley *8
Measurement of sewer work on a grade. By H. R. Buck, G. L. Walker.... 367, 389, 447
Prices at Wheaton, Ill. By W. B. Ewing 115
Ventilation of, at Winnipeg, Manitoba, through house soil pipes. (From Allen Hazen's Report.) By G. E. Hill, C. A. Hague, C. R. Felton, Alex. Potter 245, 257, 284, 347
Shaft sinking by the freezing process.. 107
Ship log, Automatic 219
Ships, Relation of depth of water to speed and power of. By D. W. Taylor 215, 276
Shonts, T. P.....*392
Shops:
Economical equipment and operation. 445
Ingersoll-Sergeant Drill Co.....*677
Lehigh Valley R. R. shops, Sayre, Pa. By D. C. N. Collins..... *99
Machine tools in railway repair shops, Condition of 558
United Shoe Machinery Co., Beverly, Mass. Reinforced concrete work. By G. P. Carver *537
Side-leveler, Contractor's. By G. W. Lee.*618
Signal, Wind-pressure danger, at viaduct 576
Signals and signaling::
Block system discussed at International Railway Congress 515
Block system on American railways. By H. D. Emerson 11, 17
Interlocking plants, Standard arrangement of signals at..... 324
New York subway system. By J. M. Waldron 546
Report at Am. Ry. Eng. & Main. of Way Assoc..... 334
Storage batteries for block signal work. By E. L. Reynolds 69
Train order system and the block system on American railways. By H. D. Emerson 11, 17
Train telegraph system 373
Silicon 473
Silk, Artificial 312
Silver production in the U. S..... 79
Sinking fund calculations, Table for. By C. C. Moore & Co..... 226
Sinking fund formula 127
Slag for ballasted bridge floors. By E. K. Morse 162
Slope stakes, Setting..... 76, 389
Smoke prevention and the mechanical stoker. By C. H. Benjamin....617, 625
Sounding raft used at Charles River dam, Mass. By J. A. Holmes..... 31
Specifications:
Engineer's fault. By J. C. Walt.... 594
Indefinite sewer specifications. By Alex. Potter 633
Locomotive forgings 659
Omission of cleaning-up clause..... 125
Railroad work specifications that are specific and fair, Ill. Cent. R. R.. 258
Specifying by reference to standards.. 554
Speed device, Variable, for machine tools.*145
Spring, Efficiency of a..... 601
Sprocket, Pope spring, for motor bicycles. *591, 601
Stadia-intersection method for topographical surveys. By L. E. Ashbaugh *328
Stamp mill, Baltic, at Redridge, Mich...*209
Standpipe protected by masonry tower.. 68
Staybolts, Hollow, as a means of admitting air to locomotive firebox..... 315
Steam engines, counterweights for. By D. S. Jacobus 659
Steam shovels:
Handling boulders with. By D. J. Hauer 4
Tunnel work *176
Steam turbines:
Accident at Newport, Eng..... 557
Comparison with a reciprocating engine. By A. S. Mann 616
De Laval, Efficiency test. By C. R. Waller *62
History and development. By Storm Bull 619
Westinghouse-Parsons, Durability of vanes *369, 389
Steamships:
"Caronia" of the Cunard Line..... 267
Draft of vessels in motion. By D. W. Taylor 275, 276
Stone-carrying steamer "Hennepin"... *59, 151
Tonnage movement of the world.... 668
Turbine steamers in trans-Atlantic service 238
Stokers, Mechanical, for boiler furnaces. By C. H. Benjamin and others... 617, 625, 667, 689
Stone, Elasticity and thermal expansion of 631

Stone handling plant of the Lake Shore Stone Co..... .....*59, 151
Storage batteries:
Bijur "high-duty" *461
Block signal work. By E. L. Reynolds 69
Stream flow. (See River gagings.)
Street-car controllers, Burning out of. By S. W. Ashe *411
Street railway investments in Mass. unprofitable 96, 97
Street sprinklers with vertical spray, New Bedford, Mass..... 23
Streets:
Design of cross-section of a street having curbs at different elevations 370, 520
Moving platforms for wagon traffic, Cleveland, Ohio *442
Stresses in Blackwell's Island bridge. By R. C. Strachan *170, 173
Submarine boat explosion..... 211
Submarine telescopes. By A. McL. Hawks 485
Subway, Pipe and wire, Detroit, Mich. By J. D. Adams *172
Subways in New York:
Hudson River tunnel terminal..... 200
Proposed new subway 23
(See also Electric railways, New York Rapid Transit.)
Superheated steam on locomotives. By H. H. Vaughan *652
Superheaters, Regulations and restrictions concerning, in Europe..... 155
Surveys and surveying:
Chicago survey. By S. N. Howard.... 127
City lots, Laying out of, bounded by curved and straight lines. By Ernest McCullough, B. J. Ashley. 497, 580
Contours in preliminary surveys, Simple method of taking and plotting. By J. E. Walker *477, 579, 665
Functions of state and national geological surveys. By Edward Orton. 234, 300
Irrigation survey of the Upper Snake River Valley, Idaho. By E. B. Darlington 576
Office methods in railway surveys. By W. D. Gerber 198
Ohio survey 284, 300, 470
Plane-table work, Concerning re-section in. By Horace Andrews, D. L. Raeburn, Antonio Llano, W. H. Lovell. 141, 580
Precise leveling between the Atlantic and Pacific oceans, First connection by. By J. F. Hayford, G. W. Colles. 270, 429
Setting slope stakes with the aid of the solar attachment of a transit. By C. M. Jones 76
Small towns, Establishing grades and monuments in. By R. B. Slippy.. 444
Stadia-intersection method for topographical surveys. By L. E. Ashbaugh *328
Subdivision of sections of land. By F. Hodgman, C. H. Gillett. 149, 470, 521

T.

Teaming yards at railway stations. By H. J. Pfeifer 61
Telegraph, Automatic type-printing..... 79
Telephone lines, Long span. By C. J. H. Woodbury 217
Telephone rates in New York City reduced 343
Telescopes, Submarine. By A. McL. Hawks 486
Tesla polyphase patents 267
Theodolite for tunnel cross-sections and general tachymeter *220
Tides on the Great Lakes.....23, 41
Ties:
Discussion of timber ties at International Railway Congress 511
Marking ties in Queensland.....*664
Nails, Galvanized steel, Experience of Pitts. & Lake Erie R. R..... 321
Report of Am. Ry. Eng. & Main. of Way Assoc..... 321
Yellow locust timber, Penn. Ry....145, 370
(See also Timber preservation.)
Timber preservation:
Creosote oils, Testing 105
Creosoted trestle timber, 25 years' experience 106
Creosoted wood not inflammable..... 451
Creosoting timber, Methods and cost of. By O. T. Dunn 443
Discussion at International Railway Congress 511
Report at Am. Ry. Eng. & Main. of Way Assoc..... 322
Seasoning and the use of saturated steam. By F. D. Beal..... 106
Strength of timber treated with preservatives 23
Zinc chloride, Determination of..... 105
(See also Wood Preservers' Association.)
Timber specifications:
Criticism of 20, 203
Report at Am. Ry. Eng. & Main. of Way Assoc..... .....*322
Tin, Mexican, First ingot of..... 605
Ton, 2,000-lb., Use of, in U. S. By T. P. Perkins 284
Track:
Ballasting, Society report on..... 321
Blast furnace slag used for ballast. By E. K. Morse, F. D. Hain..... 162, 173, 285
Cost of laying yard tracks..... 19
Longitudinal concrete supports for rails 691, 695
Southern Ry. work. By J. W. Ash. *213
Street railway track in Cincinnati. By J. M. Harper 234
Track elevation:
Chicago, in 1901..... 139
Milwaukee, Wis..... 264
Track gages, Origin of standard, in the U. S..... 232
Traffic census on asphalt and granite pavement in New York City..... 194
Train order system on American railways. By H. D. Emerson.....11, 17
Trains, High speed, N. Y. C. and Penn. Rys..... .....606, 630, 687

Trainsheds, Umbrella platform roofs a substitute for 343
Transit:
Compass erection. By C. W. Coman, F. G. Stieren 19, 41
Error in transit work. By D. S. McGrahon 579
Traveler on Thebes bridge....482, *485, *487
Tree culture by the Penn. Ry.....145, 370
Trestles, Wooden, Specifications.....*323
Triangles, Right-angled, with sides of integral ratios. By W. H. Schuerman 259
Tunnels:
East River:
Accident 349
Roadway tunnel proposed 358
Fog in N. Y. Rapid Transit tunnel.... 17
Gravehals tunnel, Norway..... 2
Gunnison, Cave-in 606, *680
Hudson River companies organized to take over work on two tunnels..45, 85
Penn. R. R.:
Compressed air plants..... 130
Waterproofing 691
Prince Edward Island—Nova Scotia... 577
St. Mary's Park tunnel, N. Y. C. R. R.*176
Seattle, Wash., Gt. Northern Ry. By C. F. Graff *262
Simplon, completed 130, 229, 373
Typhoid fever:
Butler, Pa..... 71
Chicago, Reduction, 1881-1904..... 611
Copper sulphate and copper foil or copper vessels for the treatment of typhoid-infected water 145, 149

V.

Valves:
Automatic regulating valve for reservoirs or standpipes supplied from a higher elevation. By J. W. Ledoux.*253
Balanced inlet filter valve designed for Algona, Iowa *133
Right-hand and left-hand valves defined 448
Walschaert valve gear for locomotives. 631
Ventilation:
Air washing apparatus in Pittsburg office building 558
Humidity in heated houses..... 289
New York Stock Exchange building.. 557
Sewer ventilation, Winnipeg, Man.245, 257
Viaducts:
Concrete approaches of Thebes bridge. *479, *486
Fades viaduct, France.....*585
Horse Run viaduct, Cin. South. Ry..*597
(See also Bridges.)
Vibrations in power houses.....640, *661
Voltmeter, Electrostatic, for high voltage. 691

W.

Wagon loader for crushed stone.....*224
Wagons, Dumping.....*498, *677
Wallace, John Findlay.....*392
Warship "Maine" in Havana harbor, Rights of Government to. By Alfred King 126
Washington University 692
Waste gas boilers in connection with cement kilns. By A. B. Helbig..... 103
Water, Bottle for collecting samples of, from various depths. By W. L. Butcher *444
Water analysis, Field methods of U. S. Geological Survey. By M. O. Leighton 586
Water flowing over edge of vertical pipe, Calculating 22, 77
Water-gaging device for supplying water to concrete mixer *237
Water jet for driving piles for the Sandy Hook proving ground railroad trestle. By S. A. Jubb.....*456
Water meters:
Accuracy tests at Des Moines, Ia. By C. B. Burdick *236
Brookline, Mass., Universal system.... 23
Fire service meters 521
Water pipe:
Cast-iron, Phil. By S. M. Van Loan..*351
Concrete-steel pipe for U. S. Reclamation service. By J. H. Quinton....*246
Flattening and cracking of cast-iron and of vitrified pipe under earth pressure. By W. P. Snow, J. N. Hazlehurst 42, 99
Formulas for computation of flow in wood and cement lined pipe 247
Wooden pen-stock siphon with steel elbow, Utah Sugar Co..... .....*375
Water pipe scrapers in Melbourne, Aus. *14
Water pollution:
Lake Champlain, the Boquet and Sable Rivers, Reports on..... 541
Passaic Valley pollution law unconstitutional 325
Water purification:
Anderson, Ind..... 556
Barium carbonate or oxide, Use of.... 102
Copper sulphate treatment:
Copper and iron sulphates and lime tests with mechanical filters at Anderson, Ind..... 556
Copper sulphate and copper foil or copper vessels for the treatment of typhoid-infected water.....145, 149
Discussion at American Water-Works Association 522
Middletown, Ohio. By J. M. Caird.. 33
Philadelphia filtration contracts...668, 693
Pittsburg, Pa..... .....130, 173
Water rates 522
Water softening:
Heating water under pressure. Laboratory testing apparatus devised by F. L. Hann. By Nicholas Knight.*311
Railway plants, Report on.....332, 335
Water supply:
Amsterdam, Holland. By W. P. Mason.*437
Columbus, Ohio. By R. W. Pratt.... 419
Ithaca, N. Y., Artesian well. By F. L. Getman *412
New York City:
Additional supply reported on by Burr-Hering-Freeman commission.. 78
Bill for Catskill supply in Legislature 257
Legislative restriction to the development of electric power in connection with the new water supply.. 445

*refers to illustrations and † to insets.

Water supply: (Continued.)
New York City Water Commission..23, 625
New York State Water Commission... 257, 606, 625
Philadelphia, Investigation of..... 693
Springfield, Mass., Plans.....155, 499
Underground supply. By F. E. Trask. 42
Water tank at Ogden, Ia., a failure.... 499
Water wheels, Large tangential, in California 349
Water-works:
Ephrata, Pa., Litigation..... 693
Ithaca, N. Y., Artesian well. By F. L. Getman *412
N. Y. City, High-pressure fire system. 315, *317

Waterproofing concrete structures. By W. H. Finley 95
Waterproofing Pennsylvania R. R. tunnels..... 691
Wave action in relation to engineering structures. By D. D. Gaillard....*189
Way-bill, Old stage-coach.....*386
Weed-destroyers:
City streets and sidewalks. By F. W. Jameson, B. M. Langhead....354, 603
Guayaquil & Quito Ry. By J. A. Harman 238
Weirs at Granite Spring dam, Cheyenne..*675

Wells, Artesian:
Flows from unconfined sandy strata on Long Island and in Michigan. By M. L. Fuller *329
Ithaca, N. Y., supply. By F. L. Getman *412
Measurement of low heads. By M. L. Fuller *593
West Virginia, Engineering society in.. 98
Westinghouse Electric & Mfg. Co., Engineering apprentices. By H. Eloesser 485
Wharf, Concrete-steel, Tampico, Mexico. By E. H. Connor.....*603

Wheel loads:
Safe limits of working load for wh pressures. Tests made on Hy roller bearings 418
Springs formula for the limiting loads on wheels rolling on rails. G. E. Lillie *12
Wind pressure:
Bridge design—long spans. By Th dore Cooper 17
Knee-braced mill buildings, W stresses in. By W. H. Dunbar 99
Wind pressure danger signal at Lev viaduct in Scotland 576
Wire rope. (See Rope.)
Women in engineering offices..... 631
Wood Preservers' Association..... 305

AUTHOR INDEX.

Ackerman, A. S., 286; Adams, J. D., 172; Alzugary, J. B., de, 389; Ambler, J. N., 77; Andrews, Horace, 101; Archibald, E. M., 109; Ash, J. W., 213; Ashbaugh, L. E., 328; Ashe, S. W., 411; Ashley, B. J., 580.
Babiczky, Joseph, 665; Baker, M. N., 256; Barnes, F. A., 286; Barnes, H. T., 627; Beahan, Willard, 580; Benjamin, C. H., 617; Bingham, L. L., 358; Birkinbine, John, 73; Blackwell, P. A., 232; Blinn, R. S., 41; Bone, F. A., 175; Boughton, W. H., 249; Brayton, L. F., 492; Brinckerhoff, H. W., 316; Brown, T. E., 113; Buck, H. R., 389; Bull, Storm, 619; Burdick, C. B., 266; Burgess, A. S., 20; Burns, C. S., 101; Burns, Edward, 285; Butcher, W. L., 444, 685; Butler, M. J., 284.
Caird, J. M., 33; Cairns, E. T., 390, 471; Campbell, J. L., 286, 389; Cappelen, F. W., 552; Carpenter, R. C., 13; Cartlidge, C. H., 41; Carver, G. P., 537; Cecil, George, 466; Christie, James, 71; Church, E. C., 42; Clark, E. B., 454; Clark, H. W., 27; Clements, M. F., 421; Coe, B. K., 206; Colley, G. W., 261, 420, 603; Collins, A. G., 127; Collins, D. C. N., 90; Coman, C. W., 19; Conard, C. K., 357; Condron, T. L., 497; Connor, E. H., 603; Cooper, Theodore, 15; Crane, W. E., 153, 345; Cravath, J. R., 676; Cunningham, J. H., 366, 447; Cushman, A. S., 260.
Damon, G. A., 359; Dana, R. T., 408; Daniels, F. T., 495; Darlington, E. B., 576; Darrow, F. T., 38; Dawley, H. A., 126, 174; Deans, J. S., 205; Diescher, Samuel, 348; Dunham, W. H., 99; Dunn, O. T., 443; Durham, H. W., 447.
Eavenson, H. N., 285; Eloesser, H., 485; Emerson, H. D., 11; Evans, R. R., 264; Ewing, W. B., 115.
Felton, C. R., 347; Finley, W. H., 95; Fish, J. C. L., 272; Fletcher, Robert, 345; Fogg, O. H., 99; Follows, G. H., 69; Ford, J. T., 317; Frickstad, W. N., 261; Fuller, M. L., 329, 593.
Gage, S. DeM., 27; Gaillard, D. D., 189; Gale, F. H., 316; Gerber, W. D., 198; Getman, F. L., 412; Gillette, C. E., 126; Gillett, C. H., 470; Goodrich, E. P., 98; Gould, E. S., 20; Gow, A. M., 220; Graff, C. F., 262; Groat, B. F., 255, 346; Guarini, Emile, 57.
Hague, C. A., 151, 284; Hain, F. D., 285; Hain, J. C., 127, 279, 330; Hanna, F. W., 154, 301; Hardesty, W. P., 241, 375; Harman, J. A., 238; Harper, J. M., 234; Harris, H. A., 225; Hauer, D. J., 3; Hawksworth, John, 21, 152; Hawks, A. McL., 486; Hayford, J. F., 279; Haynes, A. M., 333; Hazen, Allen, 285; Hazlehurst, J. N., 100; Helbig, A. B., 163; Henning, G. C., 60, 205, 495; Hewitt, William, 349; Higgins, Edwin, Jr., 196; Hildenbrand, Wilhelm, 127; Hill, G. E., 347; Hillebrand, W. F., 483; Hodgman, F., 419, 521; Holmes, J. A., 31; Holtzman, S. F., 347; Hoopes, J. J., 284; Horwood, C. B., 693; Howard, S. N., 127; Hoyt, J. C., 38; Hubbel, C. G., 76; Huestis, C. C., 231; Hunt, C. W., 369.
Jacobus, D. S., 659; Jameson, F. W., 555; Johnson, Lane, 175; Jones, C. M., 76; Jubb, S. A., 456.
Keefe, D. A., 205; Kent, William, 111; Kimball, H. H., 353; Knight, Nicholas, 311; Knowlton, H. S., 503.
Ladshaw, T. D., 389; Laughead, B. M., 603; Lawry, R. G., 554; Ledoux, J. W., 253; Lee, G. W., 618; Leighton, M. O., 67, 586; Leversedge, L. S., 626; Lewis, C. T., 346; Lewis, N. P., 144; Lieb, J. W., Jr., 678; Lillie, G. E., 43; Little, J. G., 547; Llano, Antonio, 102; Lovell, W. H., 580; Low, Emile, 627; Luten, D. B., 200, 496.
McCaustland, E. J., 614; McCullough, Ernest, 152, 497, 580; Macdonald, J. A., 521; McGachon, D. S., 579; Mack, J. S., 389; MacKenzie, W. B., 231, 369; Martin, Wisner, 201; Mason, W. P., 437; Merrill, F. N., 151; Meyer, F. V., 520; Mitchell, J. A., 96, 260; Mohler, C. K., 421; Moisseiff, L. S., 218; Moore, L. C., 65; Morgan, C. H., 340, Morse, E. K., 162; Morton, Paul, 126; Murphy, E. C., 355, 432, 489; Murphy, W. T., 19.
Nelson, T. M., 285; Newell, F. H., 610; Nicolet, C. H., 76.
Orton, Edward, 391; Osgood, E. P., 42.
Pagan, W., 605; Parker, R. E., 151; Parmley, W. C., 8; Payne, H. M., 98; Perkins, T. P., 284; Pfeifer, H. J., 61; Poss, J. H., 421; Potter, Alexander, 98, 347, 348, 603; Potter, W. B., 140; Potts, Clyde, 41; Pratt, R. W., 419; Purdy, C. T., 103.
Quinton, J. H., 246.
Ray, W. M., 410; Reaburn, D. L., 102; Reimann, R., 259; Reynolds, E. L., 69; Rhines, G. V., 419; Rice, C. W., 74; Rice, F. S., 437; Richardson, Clifford, 84; Rich A. S., 159; Robinson, H. F., 450; Rog G. A., 624; Rollins, C. H., 43.
Sadtler, S. S., 9; Schermerhorn, Richar Jr., 259; Schuerman, W. H., 390; Scott, A. M., 114, 447; Seely, Walter, 77; Shaw, J. M., 89; Shaw, F. H., 345; Shearwood, J. P., 495; Shelley, H. W., 41; Shepherd, F. I. Sherman, C. E., 470; Shinn, J. A., 389, 695; Shnable, E. R., 20; Sinks, F. F., 8; Slow, W. P., 42; Slippy, R. B., 444; Solow, A. S., 287; Springer, J. H., Sr., 312; Stadly, O. W., 447; Starr, H. W., 664; Stearns, F. P., 72; Stearns, G. A., 275; Steiner, C. R., 256, 447, 664; Stevens, H. L., 581; Stieve E., 41; Stockton, John, 346; Stowell, C. C., 206; Strachan, R. C., 170; Stratton, S. W., 98; Strauss, J. B., 22; Street, C. F., 560; Swain, A. M., 369.
Taylor, D. W., 276; Thomson, F. DuP., 270, Tillinghast, F. H., 491; Toch, Maximilian, 420; Torrance, W. M., 548; Trask, F. E., 42; Trump, E. N., 620; Turner, C. A. P., 689; Tyrrell, H. G., 10, 302.
Van Loan, S. M., 351; Varney, Theodore, 363; Vaughan, H. H., 652; Von Bayer, H., 369; Von Geldern, Otto, 377.
Walt, J. C., 594; Waldron, J. M., 548; Walker, G. L., 390; Walker, J. E., 448; Wallace, C. H., 494; Waller, C. R., 62; West, O. J., 295; Wheeler, Holland, 520; Whited, Willis, 85, 116; Wiley, A. J., 671; Wilson, R. L., 306; Winslow, G. R., 259; Woodbury, C. J. H., 217; Woolson, I. H., 383, 561; Wooten, W. P., 247; Worley, J. S., 77.

TABLE OF ERRATA.

Bridge over Chicago River at North Western Ave..... .....(64), 127
Catalogue of Caldwell & Son..... 422
Dams, Bear trap..... .... (77), 175
Excavator, Chicago sewer.....(116), 175
Girders, Concrete-steel .....(112), 152
Railway, Cerro de Pasco.....(463), 555
Sinking fund formula (Sept. 29, 1904)... 127

ENGINEERING LITERATURE (SUPPLEMENT).

EDITORIALS.

B.
Bending moment, Sign of..... 179
Biographical directory of American engineers proposed..... 47
C.
Cast steel, Use of term..... .....47, 180
E.
Engineering education and the so-called liberal education..... 47
Engineers' field books, Proper form for.. 201, 525
G.
Gas works, Lack of American books on.. 47
H.
Home-study course for machinists and others. Ernest McCullough.. 292
L.
Lawrence, Mass., sewage purification experiments, Need of digest of..... 525
N.
Nomenclature in applied mechanics.... 201
P.
Prizes offered for best paper on concrete blocks..... 291
R.
Reinforced concrete, Use of term..... 179
Reviewers of books..... 525
S.
Scrap books with interchangeable leaves. 48
Shaft-sinking, Books on..... 179
Sign of bending moment..... 179
Signs for compressive and tensile stress. 48
Smoke prevention and fuel economy..50, 180
T.
Trees and woods, Books on..... 526
V.
Ventilation, British and American books on..... 48
W.
Water tanks, Wood, Scanty literature on 47
Water-works office, Books for.....525, 530

TITLES.

A.
Alternating Current Machinery..... 637
American Ceramic Society..... 52
American Electrochemical Society..... 531
American Institute of Electrical Engineers 204
American Society of Mechanical Engineers 237
American Street Railway Association.... 50
Art of Generating Gear-Teeth..... 297
Association of American Portland Cement Manufacturers 55
Association of Railway Superintendents of Bridges and Buildings 293
Assuan Reservoir and Lake Moeris.... 403
Automobile Pocketbook.. 635
B.
Berechnung von Verbund-Decken im Bau-Gewerbe.. 400
Boston Finances 55
British Progress in Municipal Engineering. 397
Bulletin of the Bureau of Standards.... 297
Burning of Town Refuse..... 642
C.
Calcareous Cements: Their Nature, Manufacture and Uses 646
Canadian Society of Civil Engineers.... 166
Canadian Transcontinental Railway Commission 81
Canaux 183
Cape Society of Civil Engineers..... 533
Car Interchange Manual.... 531
Cement and Concrete..... 395
Cement-Workers' Hand-Book 637
Centrifugal Fans 644
Chapter on Brickwork 533
City Life and Progress 635
Civic Centers for New York..... 528
Coal-Testing Plant..... 283
Common Lot 181
Complete Class-Book of Naval Architecture 529
Connecticut State Board of Health 184
Copper as an Algicide and Disinfectant in Water Supplies 400
Cost of Pumping for Irrigation 55
Course of Wholesale Prices, 1890-1904.. 646
Crushed Stone and Its Uses..... 50
Cyclopedia of Applied Electricity..... 294
D.
Descriptive Geometry 533
Differential Equations 641
Directory American Cement Industries.. 642
Drapers' Company Research Memoirs.. 527
E.
Earth and Rock Excavation 639
Economic Improvement in Railways 185
Electric Lighting 53
Electric Railways 532
Electrical Transmission of Energy 53
Elementary Course in Mechanical Drawing 186
Elements of Applied Microscopy 295
Elements of Mechanics 393
Engineers of Canadian Society 166
Engineers of the U. S. Reclamation Service 109
Experimental Researches on the Constitution of Hydraulic Mortars 645
Experimental Researches on the Flow of Steam Through Nozzles and Orifices 533
F.
Field Practice of Railway Location.... 529
Fowler's Electrical Engineer's Year Book and Directory 50
Function of Masonry in Modern Architectural Structures 186
Future of Road-Making in America.... 183
G.
Gas Engine Design 523
Gas Engines and Producer Gas Plants.. 526
Generator, Kraftgasund Dampfkessel-Betrieb 396
Geological Survey Reports..... 184
Granger Movement in Illinois 296
Graphic Methods by Influence Lines for Bridge and Roof Computations 401
Graphic Statics 53
Grouping of Public Buildings 51
H.
Handbook for Superintendents of Construction, Architects, Builders and Building Inspectors 642
Handbook on Sanitation 49
Health Booklets 180
How to Handle Freight 296
How to Mix Paints 402
I.
Illinois Good Roads Commission.. ..298, 402
Illinois Railway Legislation and Commission Control Since 1870..... 296
Incorporated Association of Municipal and County Engineers 402
International Acetylene Association 50
International Association of Municipal Electricians 402
Introduction to Projective Geometry and its Applications 183
Italian, The, in America 532
J.
James Watt 635
Journal of the Iron and Steel Institute.. 293
L.
Laboratory and Factory Tests in Electrical Engineering 182
Laboratory for the Testing of Road Materials at Columbia University..... 533
Laboratory Notes on Practical Metallurgy 639
Lebendige Kraefte 50
Lecture Notes on Some of the Business Features of Engineering Practice. 635
Lehrbuch des Tiefbaues 400
Letters from an Old Railway Official to his Son, a Division Superintendent.. 54
Letter of Petrus Peregrinus on the Magnet 49
Lives of the Engineers George and Robert Stephenson 532
Long-Range Weather Forecasts 532
M.
Manual of Corporate Organization 293
Manual of Mining 293
Manual of Statistics..... 538
Manuel Pratique des Moteurs a Gaz et Gazogenes 180
Manufacture of Hydraulic Cements 403
Marine Engines and Boilers 636
Massachusetts State Board of Health.. 52
Mathematics of the Paper Location of a Railroad 529
Mechanical Engineering of Collieries ... 528
Mechanical Filtration 185
Mechanical Handling of Material 637
Mechanism 300
Medical Handbooks 180
Metallurgie Generale 639
Metamorphism 55
Military Landscape Sketching 646
Mineral Industry during 1903..... 181
Mines and Quarries 293
Modern Asphalt Pavement 637
Modern Civic Art 400
Mosquitos or Culicidæ of New York State 528
N.
Naval Constructor 181
New Knowledge 641
O.
Ohio Cooperative Topographic Survey. 293
Ohio State Board of Health 635
On the Absorption of Electromagnetic Waves by Living Vegetable Organisms 295
On Tybee Knoll 638
Ordinary Foundations 49
Osborn's Tables of Moments of Inertia.. 638
Ottawa Improvement Commission..... 186

*refers to illustrations and † to insets.

P.

Petrol Motors and Motor Cars 186
Pioneer Irrigation 184
Plane and Spherical Trigonometry..... 399
Pocket Book of Refrigeration and Ice-Making 645
Problems of the Panama Canal 645
Producer Gas 51
Properties of Steel Sections 638
Purification of Water from a Sanitary Standpoint 185

R.

Radioactivity 641
Railroad Stations 184
Railway Signal Association 185
Railway Track with Compound Rails.. 185
Rapid Determination of Sulphate in Cement 645
Recherches Experimentales sur la Constitution des Mortiers Hydrauliques 184
Reinforced Concrete 49
Relation of Preventable Disease to Taxation 185

Report of Cooperative Irrigation Investigations in California 185
Report of a Sporadic Outbreak of Typhoid Fever at Lawrence, N. Y., due to Oysters 402
Report on the Strength of Structural Timber 186
Rhode Island State Board of Health .. 184
Roadmaster's Assistant 54
Roads in Iowa 143
Royal Commission on Sewage Disposal. 52
Russian Provisional Fortifications..... 645

S.

St. Lawrence River 642
Sanitary Journal of the Provincial Board of Health, Ontario 183
Sanitary Law and Practice 399
Science Year-Book 181
Seats of the Colonists and Other Furnishings 49
Secret of the Circle and the Square.... 527
Sewage Problem 534
Sewerage and Sewage Disposal, York.... 403

Short Course in Alternating-Current Testing 182
Short Story of Isambard K. Brunel.... 645
Smoke Prevention and Fuel Economy.50, 180
Society for the Promotion of Engineering Education 640
Soil Survey of the Long Island Area, New York 533
Steam Engine and Other Steam Motors.. 397, 525
Steam Pipes: Their Design and Construction 640
Steam Turbines 526
Steuerunger der Dampfmaschinen..... 398
Strategy of Great Railroads 55
Structural Designers' Handbook..... 182
Suction Gas 184

T.

Tables for Roof Framing, etc..... 404
Telephone Service: Its Past, its Present, its Future 50
Temperature-Entropy Diagram 526

Testing of Continuous Current Machines in Laboratories and Test-Rooms.. 638
Text-Book on Roofs and Bridges 184
Torresdale Conduit 403
Treatise on Concrete, Plain and Reinforced 396
Treatise on Mathematical and Graphical Roof Framing 638
Trusts, Pools and Corporations 295
Typhoid Fever at Ithaca, N. Y..... 185

U.

U. S. Coast and Geodetic Survey..... 296

W.

Wasserbau, Der 183
Water Hammer 526
Water Supply and Irrigation Papers, U. S. Geological Survey 54, 402
Water-Works Systems for Small Towns, Cities, etc 50
Well-Ordered Household; or the Ideal City 403
Windmills in Foreign Countries 54

CONSTRUCTION NEWS (SUPPLEMENT).—CONTRACT PRICES.

Air systems, Columbus, O..... 241
Arch centering, Pittsburg, Pa.....110, 113
Asphalt, Detroit, Mich, 91; Winnipeg, Man., 129; see also Paving.
Asphalt oil, Detroit, Mich..... 91
*Asphalt Paving, New York, N. Y., 52; Seattle, Wash., 189.
Backfill, Pittsburg, Pa..... 160
Backing, stone, Columbus, O..... 241
*Barrier San Francisco Cal.. 169
Bars, reinforcing, New York, N. Y..169, 249
Bench mark and set, New Orleans, La.. 201
Blocks and wedges, New Orleans, La.. 201
Blow-offs, New York, N. Y..... 7
Bluestone, Plainfield, N. J..... 232
Bolt holes in masonry, Wheeling, W. Va. 189
Bolts and nuts, Louisville, Ky..... 250
Boulders, removing, Boston, Mass...232, 249
Branches, see Sewer pipe specials and Water pipe specials.
*Breakwater superstructure, Buffalo, N. Y..... 221
*Bridge approaches, New York, N. Y.169, 249
*Bridge, reconstruction, St. Paul, Minn. 34
Bridge seats, granite, New York, N. Y.. 150
Bridge steps, New York, N. Y..... 169
Bridge, Pittsburg Pa..... 160
Brush bundles, Savannah, Ga..... 241
Brush mattress, San Francisco, Cal.... 169
Building brick, New London, Conn..... 79
Cable, San Francisco, Cal..... 169
Capping, New Orleans, La..... 169
Capping stone, Buffalo, N. Y..... 221
Caps and bases, granite, New York, N.Y. 150
Castings, brass or bronze, New York, N. Y..... 221
Castings, iron, Columbus, O., 241; New York, N. Y., 221.
Castings, special, Cleveland, O., 201; Columbus, O., 241; Salt Lake City, Utah, 169; Seattle, Wash., 188.
Castings, steel, Brooklyn, N. Y., 16; Pittsburg, Pa., 113.
Cast iron, Glendive, Mont., 232; New Orleans, La., 102, 169, 232; Pittsburg, Pa., 110, 113, 160; Plainfield, N. J., 232.
Catchbasins, Boston, Mass., 150; Cleveland, O., 221; Houston, Tex., 79; New York, N. Y., 150, 221; Pittsburg, Pa., 112; Seattle, Wash., 189.
Catchbasins, concrete, Boston, Mass.... 160
Catchbasin covers, adjusted, Seattle, Wash..... 189
Catchbasin frames, Pittsburg, Pa..... 110
Catchbasin heads, reset, New York, N. Y..... 150
Catchbasin manhole frames, Pittsburg, Pa..... 112
Catchbasins, rebuilt, Seattle, Wash.... 189
Cement, change in ratio, Pittsburg, Pa. 112, 113, 114
Cement, hauling, San Francisco, Cal.... 102
Cement, Portland, Cincinnati, O., 79; Manila, P. I., 68; Newport, R. I., 91; New York, N. Y., 169, 221, 249; Portland, Me., 188; San Francisco, Cal., 102; Wheeling, W. Va., 129.
Channelling solid rock, Chicago, Ill.... 160
Channels, see Steel.
*Chanoine Dam, Pittsburg, Pa..... 160
Cinders, Gloversville, N. Y., 232; New Orleans, La., 201.
Cleaning stone, Plainfield, N. J..... 232
Clearing reservoir, New York, N. Y.... 221
Coating, Portland cement and mortar, Boston, Mass..... 200
Coating, waterproof, Boston, Mass....79, 200
Concrete, Boston, Mass, 79, 200; Brooklyn, N. Y., 16; Cincinnati, O., 91; Coldwater, Mich., 52; Columbus, O., 241; Denver, Colo., 150; Glendive, Mont., 232; Havre de Grace, Md., 16; Houston, Tex., 79; Idaho Falls, Idaho, 201; Los Angeles, Cal., 130, 232; New Haven, Conn., 151; New Orleans, La., 169, 201; New York, N. Y., 7, 16, 52, 79, 150, 169, 221, 232; Phoenix, Ariz., 91; Pittsburg, Pa., 110, 112, 113, 114, 160, 222; Plainfield, N. J., 232; San Francisco, Cal., 169; Seattle, Wash., 91, 188; Washington, Ga., 34; Wheeling, W. Va., 189; West Orange, N. J., 7.
Concrete base, paving, Seattle, Wash.. 189
Concrete blocks, New York, N. Y..... 221
Concrete, change in ratio, Pittsburg, Pa. 110
Concrete, face dressing, New York, N. Y. 221
Concrete, placing, Boston, Mass..... 200
Concrete, Portland cement, Chicago, Ill., 169; Waterville, Me., 169.
Concrete, reinforced, Pittsburg, Pa..... 110, 113, 114
Coral excavation, dredge, Panama..... 241
*Concrete terrace wall, Holyoke, Mass.. 241
Conduits, New York, N. Y., 150; Pittsburg, Pa., 110, 112, 113.
Coping, granite, New Haven, Conn., 151; New York, N. Y., 150.
Corporation cocks, see Water pipe specials.
Cribwork, New York, N. Y..... 150
Crosses, Havre, Mont..... 188
*Cross River Dam, New York, N. Y..... 221
Crosswalks, New York, N. Y., 150; Seattle, Wash., 169, 189.
Curb, Danville, Ill., 151; New York, N. Y., 7; Wheeling, W. Va., 189.
Curb and gutter, East St. Louis, Ill., 79; Freeport, Ill., 232; Pittsburg, Pa., 111, 112; Racine, Wis., 102.
Curb, cement, Dayton, O..... 232
Curb, concrete, Corning, N. Y., 241; Seattle, Wash., 189.
Curb protection, Corning, N. Y..... 241
Curb, remove and reset, New Orleans, La..... 201
Curb, reset, Danville, Ill., 151; Gloversville, N. Y., 232; Mankato, Minn., 160; New York, N. Y., 150; Pittsburg, Pa., 112, 222.
Curb, stone, Brooklyn, N. Y., 16; Danville, Ill., 151; Mankato, Minn., 160; Minneapolis, Minn., 150; New York, N. Y., 150, 169, 221; Pittsburg, Pa., 222; Seattle, Wash., 189.
Curb, stone, and set, New York, N. Y.. 52, 79
Curb, stone, old, rejointed, New York, N. Y..... 52, 79
*Dam and Bridges, Phoenix, Ariz..... 91
*Dam No. 2, Pittsburg, Pa..... 160
*Dam No. 18, Wheeling, W. Va..... 189
*Dam, Iowa City, Ia..... 249
Depth recorders, Columbus, O..... 241
Dike, Mare Island, Cal..... 134
*Diversion Dam, Belle Fourche Project, Denver, Colo..... 150
Down spouts, New Orleans, La., 102, 232; New York, N. Y., 150.
Drain boxes, New York, N. Y..... 150
Drains, box, Seattle, Wash..... 169
Drains, iron, Pittsburg, Pa.....110, 114
Drains, cast iron, Pittsburg, Pa..... 114
Drain pipe, Boston, Mass., 7; New Haven, Conn., 151; Pittsburg, Pa., 111, 112, 113.
Drain pipe, agricultural, Pittsburg, Pa. 113
Dredging, see Earth excavation and Rock excavation.
Drift bolts, Pittsburg, Pa..... 160
*Driven Wells, Havre, Mont..... 188
Ducts, steel pipe, Pittsburg, Pa..... 110, 112, 113
Earth disposal, Pittsburg, Pa..... 110
Earth excavation, Brooklyn, N. Y., 16; Cincinnati, O., 91; Columbus, O., 241; Denver, Colo., 151, 222; Glendive, Mont., 232; Los Angeles, Cal., 130, 232; New Orleans, La., 169, 201; New York, N. Y., 221; Pittsburg, Pa., 110, 112, 113, 114, 160; Washington, Ga., 34; Waterville, Me, 169.
Earth excavation and backfill, tunnel, Boston, Mass., 79, 221; Havre, Mont., 188; Jefferson City, Mo., 16; Salt Lake City, Utah, 169.
Earth excavation and backfill, wet, Salt Lake City, Utah..... 169
Earth excavation and disposal, Chicago, Ill..... 160
Earth excavation, dredge, Boston, Mass., 232; Buffalo, N. Y., 221; Cleveland, O., 221; Denver, Colo., 222; Detroit, Mich., 68; Grand Rapids, Mich., 160; Mobile, Ala., 221; New Orleans, La., 79; Newport, R. I., 188, 189, 200, 221; New York, N. Y., 150; Norfolk, Va., 68; Panama, 241; Portland, Me., 221; Wilmington, Del., 232, 249.
Earth excavation, foundation, Denver, Colo., 150; New York, N. Y., 150; Phoenix, Ariz., 91.
Earth excavation, grading, Boston, Mass., 7, 150, 160; New York, N. Y., 52; Salt Lake City, Utah, 169; Seattle, Wash. 189; Washington, D. C., 160.
Earth excavation, overhaul, Casper, Wyo., 34; Denver, Colo., 151, 222; Glendive, Mont., 232; New Orleans, La., 169; New York, N. Y., 221; Phoenix, Ariz., 91; Waterville, Me., 169.
Earth excavation, rehandling material, New Orleans, La..... 139
Earth excavation, street, Bowling Green, O., 160; Cleveland, O., 221; Corning, N. Y., 241; East St. Louis, Ill., 79; Freeport, Ill., 232; Gloversville, N. Y., 232; Seattle, Wash., 91, 169.
Earth excavation, trench, Boston, Mass., 221; Idaho Falls, Idaho, 201; New York, N. Y., 7, 16; Pittsburg, Pa., 110, 113; Plainfield, N. J., 232; Seattle, Wash., 188; Waterbury, Conn., 249; Waterville, Me., 169.
Earth excavation, submerged, Denver, Colo., 150; Glendive, Mont., 232; New York, N. Y., 150.
Earth excavation, tunnel, Waterbury, Conn..... 249
Edge-stone, Boston, Mass., 150, 160; Cleveland, O., 221.
Embankment, Cincinnati, O., 91; Coldwater, Mich., 52; Jefferson City, Mo., 16; Pittsburg, Pa., 110, 112, 113, 160; San Francisco, Cal., 169; Washington, D. C., 160.
Embankment, filling, Boston, Mass., 7, 150, 160; New Haven, Conn., 151; New York, N. Y., 7, 52, 150, 169; Pittsburg, Pa., 110, 113, 114, 160, 222; Plainfield, N. J., 232; Salt Lake City, Utah, 169; San Francisco, Cal., 79; Wheeling, W. Va., 189.
Embankment, rock filling, New York, N. Y., 169; San Francisco, Cal., 169; Wheeling, W. Va., 189.
Embankment, rolled, Columbus, O., 241; Pittsburg, Pa., 112.
*Excavation, Colon, Panama 241
Excavation and concrete sheeting, Boston, Mass..... 200
Excavation, gravel and boulders, Idaho Falls, Idaho..... 201
Excavation, rock and earth, Los Angeles, Cal., 130; New York, N. Y., 169, 221; Pittsburg, Pa., 160; San Francisco, Cal., 169; Wheeling, W. Va., 189.
Expanded metal, New Haven, Conn.... 151
Extension stems, Columbus, O..... 241
Felt, tarred, Boston, Mass..... 79
Fence, Boston, Mass., 150; New Haven, Conn., 151; New York, N. Y., 221.
Filling, see Embankment.
*Filtration Plant, Pittsburg, Pa..... 110, 111, 112, 113, 114
Flagging, see Sidewalks.
Flange unions, see Water pipe specials.
Floor, granolithic, Chicago, Ill., 160; Pittsburg, Pa., 111.
Floor, wood, St. Paul, Minn..... 34
Flushtanks, Havre de Grace, Md., 16; Houston, Tex., 79; Idaho Falls, Idaho, 201; Jefferson City, Mo., 16; Mt. Carmel, Pa., 222; New Orleans, La., 201; Salt Lake City, Utah, 169; Topeka, Kan., 68; West Orange, N. J., 7.
Gates, Denver, Colo., 150; Seattle, Wash., 188.
Gate boxes, Brooklyn, N. Y..... 16
Gate chambers, brick, Seattle, Wash.. 188
Gates, flap, Columbus, O..... 241
Gates, sluice, Columbus, O., 241; Pittsburg, Pa., 110, 112, 113; Plainfield, N. J., 232.
*Grading, Boston, Mass..... 7
Grading, see Earth excavation and Rock excavation.
Granolithic finish, New York, N. Y.... 221
Gravel, Boston, Mass., 221; Columbus, O., 241; New Orleans, La., 201.
Gravel, filter, Columbus, O., 241; Pittsburg, Pa., 110.
Grillage, New York, N. Y..... 150
Grout, Boston, Mass., 79, 200; New York, N. Y., 221.
Gutters and channels, paved, Pittsburg, Pa..... 111
Gutters, brick, Seattle, Wash..... 189
Gutters, concrete, Boston, Mass....150, 160
Gutters, galvanized, New Orleans, La.. 102, 232
Gutter, paved, Columbus, O., 241; New York, N. Y., 150; Pittsburg, Pa., 113.
Hedges, Pittsburg, Pa..... 111
*High Pressure Mains, Brooklyn, N. Y.. 16
Hose connections, Pittsburg, Pa..... 111
Hose, Pittsburg, Pa..... 110, 112
House connections, see Water pipe specials and Sewer pipe specials.
Hydrant boxes, brick, Salt Lake City, Utah..... 169
Hydrants, Minneapolis, Minn., 102; New Orleans, La., 201; New York, N. Y., 7; Pittsburg, Pa., 110, 112, 113; Seattle, Wash., 188, 189.
Hydrants, haul and set, Brooklyn, N. Y. 16
Hydrants, reconnecting, Seattle, Wash.. 188
Hydrants, setting, New Orleans, La., 201; Waterville, Me., 169.
Hydrants with yokes, Seattle, Wash.... 188
I-beams, see Steel.
Indicating apparatus, Pittsburg, Pa.... 110
Indicator stands, Columbus, O., 241; Pittsburg, Pa., 110.
Inlets, Danville, Ill., 151; Mt. Carmel, Pa., 222; New York, N. Y., 169; Seattle, Wash., 189; Topeka, Kan., 68.
Intakes, Freeport, Ill..... 232
Interceptors, sewer, Mt. Carmel, Pa.... 222
Iron, Boston, Mass..... 221
Iron and steel, Cincinnati, O., 91; New York, N. Y., 169; Seattle, Wash., 91; Wheeling, W. Va., 189.
Iron corners, Mankato, Minn..... 160
Iron, corrugated, New Orleans, La..102, 232
Iron gratings, Mankato, Minn..... 160
*Irrigation Canal, Denver, Colo., 151, 222; Glendive, Mont., 232.
Junction boxes, New York, N. Y..... 150
"Kahn" bars, New Haven, Conn..... 151
*Kimberly Ave. Bridge, New Haven, Conn..... 151
Labor, Cleveland, O., 221; Salt Lake City, Utah, 169.
*"Laguna" Dam, Los Angeles, Cal..130, 232
Lampholes, Jefferson City, Mo., 16; Mt. Carmel, Pa., 222.
Lampposts, New York, N. Y..... 170
*Lincoln Ave. Bridge, Pittsburg, Pa.... 222
Loam, Boston, Mass., 160; Cleveland, O., 221; Columbus, O., 241.
Loam, placed, Boston, Mass..... 150
*Lockport Power House, Chicago, Ill.. 160
*Locks, Cincinnati, O..... 91
Lumber, see also Timber.
Lumber, Brooklyn, N. Y., 16; Denver, Colo., 150; Glendive, Mont., 232; Havre de Grace, Md., 16, 188; Houston, Tex., 79; New Orleans, La., 169, 201; New York, N. Y., 7, 169; Pittsburg, Pa., 110, 113, 150; Salt Lake City, Utah, 169; Seattle, Wash., 91, 189; San Francisco, Cal., 169; Topeka, Kan., 68.
Macadam, Bowling Green, O., 160; Cleveland, O., 221; New Haven, Conn., 151; New York, N. Y., 7, 150, 169; Pittsburg, Pa., 111, 112, 113; Salem, N. H., 249.
*Main carrier sewer, Waterbury, Conn.. 249
Manholes, Coldwater, Mich., 52; Havre de Grace, Md., 16; Houston, Tex., 79; Idaho Falls, Idaho, 201; Mt. Carmel, Pa., 222; New Orleans, La., 201; New York, N. Y., 150; Salt Lake City, Utah, 169; Seattle, Wash., 91, 189; San Francisco, Cal., 169; Topeka, Kan., 68; West Orange, N. J., 7.
Manholes and flushtanks, combined, Salt Lake City, Utah..... 169
Manholes, brick, Jefferson City, Mo., 16; Pittsburg, Pa., 112.
Manhole frame, Mankato, Minn., 160; Pittsburg, Pa., 110.
Manhole frames and covers, Pittsburg, Pa..... 112
Manhole heads, New York, N. Y..... 16
*Marginal Conduit, Boston, Mass..... 221
Masonry, Phoenix, Ariz., 91; Washington, Ga., 34; Waterbury, Conn., 248.
Masonry, brick, Boston, Mass., 79, 200; Brooklyn, N. Y., 16; Columbus, O., 241; Houston, Tex., 79; New Orleans, La., 201; New York, N. Y., 7, 16, 150; Pittsburg, Pa., 110, 112, 113, 114; Washington, Ga., 34; Waterbury, Conn., 249; Waterville, Me., 169; West Orange, N. J., 7.
Masonry, concrete, Boston, Mass., 221; Jefferson City, Mo., 16; New Orleans, La., 201; New York, N. Y., 221; Waterbury, Conn., 249.
Masonry, cyclopean, New York, N. Y.. 221
Masonry, dimension stone, New York, N. Y..... 221
Masonry, rubble, Boston, Mass., 7; New York, N. Y., 52, 169, 221, 248; Waterville, Me., 169; West Point, N. Y., 188.
Masonry, stone, Boston, Mass., 150; New York, N. Y., 150.
Masonry, removing, Pittsburg, Pa..... 113
Metal work, care for and set, New York, N. Y..... 221
Metal, expanded, Pittsburg, Pa..... 113
Metal lath, New York, N. Y..... 16
Meters, water, Pittsburg, Pa., 110; Winnipeg, Man., 241.
Meter, Venturi, Columbus, O., 241; Pittsburg, Pa., 112.
Monument cases, Seattle, Wash..... 180
Mortar, Portland cement, Boston, Mass. 79
*Orleans Relief Canal, New Orleans, La. 160
*Outlet and regulating works, Hazen, Nev..... 250
*Outlet Tunnel and Shafts, Casper, Wyo. 34
Oyster shells, New Orleans, La..... 201
Painting, Pittsburg, Pa..... 110

*refers to title of work.